

(12) **United States Patent**
Griffin et al.

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(54) **LOCKOUT SYSTEM FOR ENERGY SOURCES**

E05B 65/48; E05B 65/0089; E05B 65/006; E05B 63/123; E05B 63/0052; E05B 63/0004; E05B 51/00; E05B 43/005; E05B 41/00; E05B 39/04; E05B 37/0096; E05B 2047/0067; E05B 2047/0071; E05B 63/143; E05B 67/383; E05B 17/226; E05B 2047/0094; E05B 67/32; E05B 67/38;

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(Continued)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(21) Appl. No.: **16/742,527**

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(22) Filed: **Jan. 14, 2020**

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(65) **Prior Publication Data**

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(Continued)

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Related U.S. Application Data

(63) Continuation-in-part of application No. 15/785,582, filed on Oct. 17, 2017, now Pat. No. 10,570,644, (Continued)

(57) **ABSTRACT**

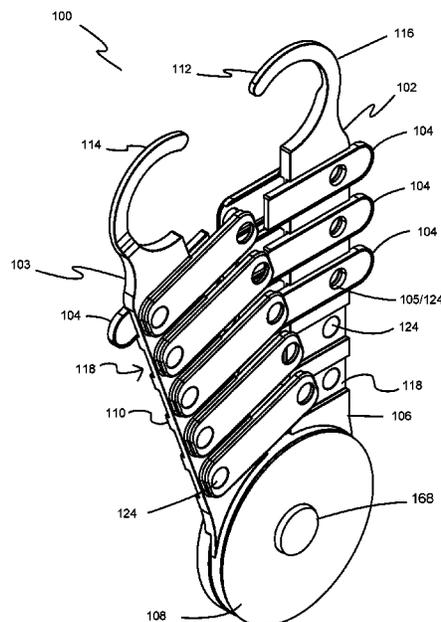
A lockout system includes a hasp assembly and a plurality of tags. The hasp assembly has a back plate defining slots each sized and shaped to receive a tag. The back plate and tags each have openings that align when a tag is received in a slot. A first hasp portion has a first loop portion and a second hasp portion has a second loop portion. The first and second hasp portions are rotatable with respect to one another such that moving the lockout system has both an unlocked position and a locked position associated with an open position and a closed position. In the closed position, the first and second hasp portions complete and define a closed loop, where one or more tags can be installed in slots preventing further movement from the closed position.

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E05B 17/22 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **E05B 51/00** (2013.01); **E05B 17/226** (2013.01); **E05B 37/0096** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H01H 9/20; H01H 9/281; H01H 9/282; H01H 9/283; E05B 63/0069; E05B 67/36;

10 Claims, 20 Drawing Sheets



Related U.S. Application Data

which is a continuation of application No. 15/435,365, filed on Feb. 17, 2017, now Pat. No. 9,881,749.

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E05B 39/04 (2006.01)
E05B 41/00 (2006.01)
E05B 63/00 (2006.01)
E05B 63/12 (2006.01)
E05B 63/14 (2006.01)
E05B 67/38 (2006.01)
E05B 65/00 (2006.01)
E05B 43/00 (2006.01)
E05B 37/00 (2006.01)
G07C 9/00 (2020.01)
H01H 9/28 (2006.01)
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E05B 67/32 (2006.01)

(52) **U.S. Cl.**

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(58) **Field of Classification Search**

CPC G07C 9/00309; G07C 2009/00769; G07C 9/00896; G07C 9/0069; G09F 3/20

USPC 70/14–19, 36, 37, 177–180, 278.7, 70/DIG. 63, DIG. 30; 292/281–286, 292/307 R, 307 A, 328, 329; 40/649, 40/657; 340/539.1, 542, 5.31; 200/43.11, 43.14, 43.15, 43.22

See application file for complete search history.

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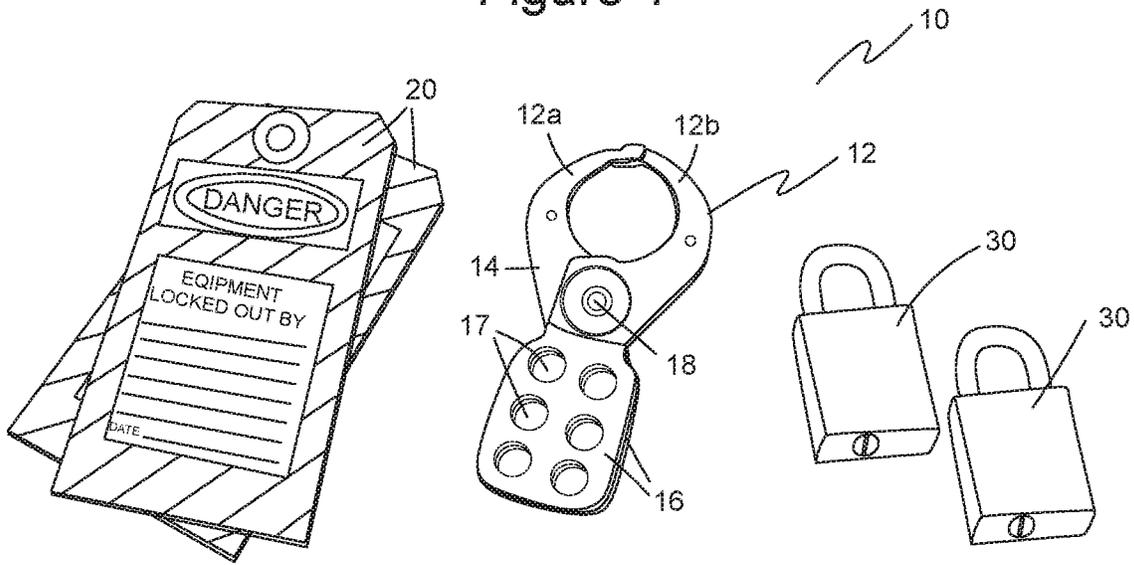
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Figure 1



(PRIOR ART)

Figure 2

(PRIOR ART)

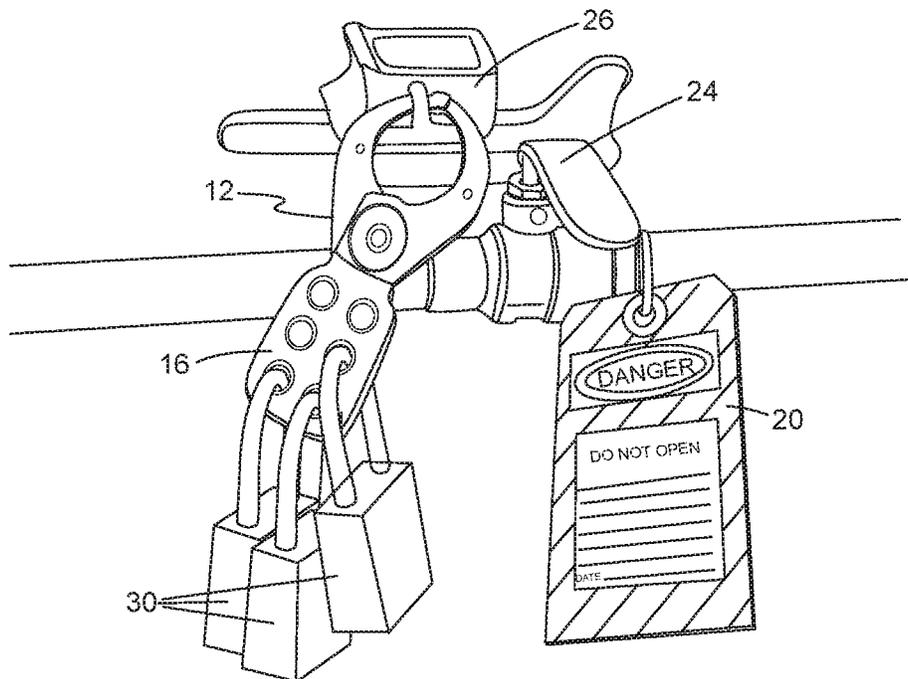


Figure 3
(PRIOR ART)

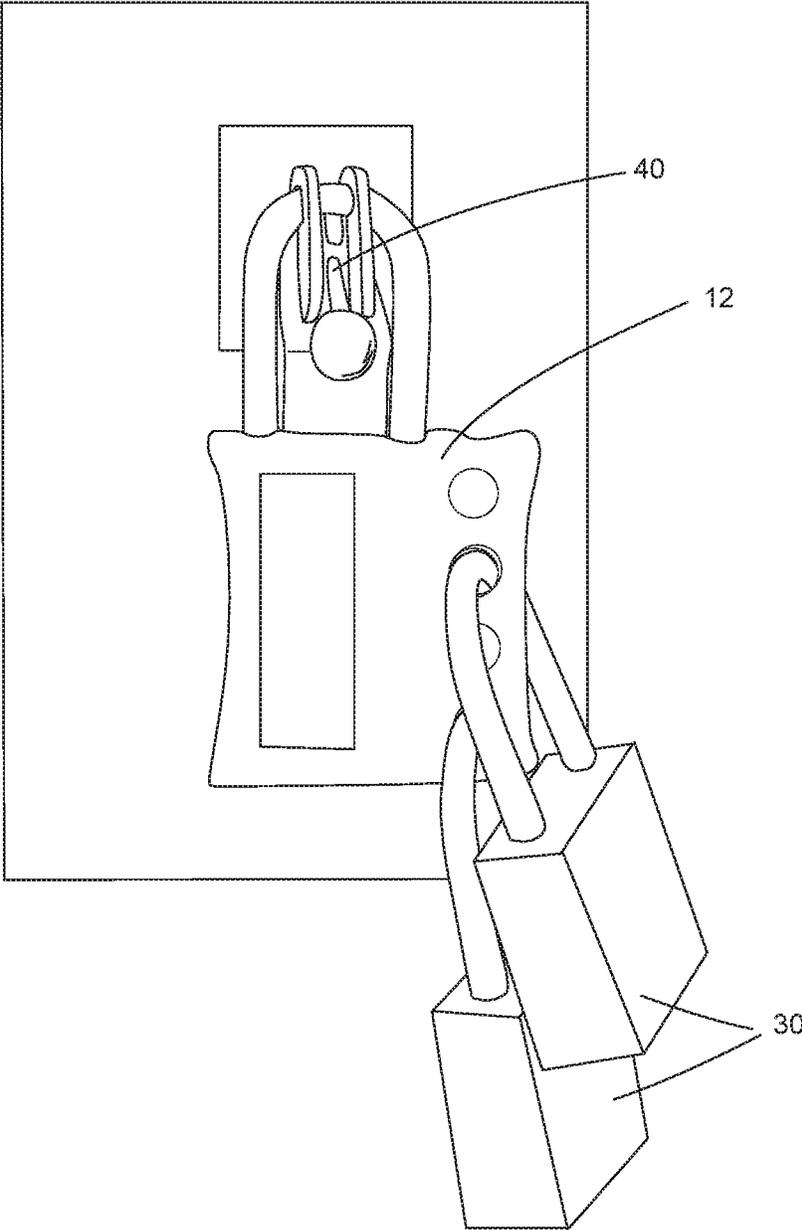


Figure 4

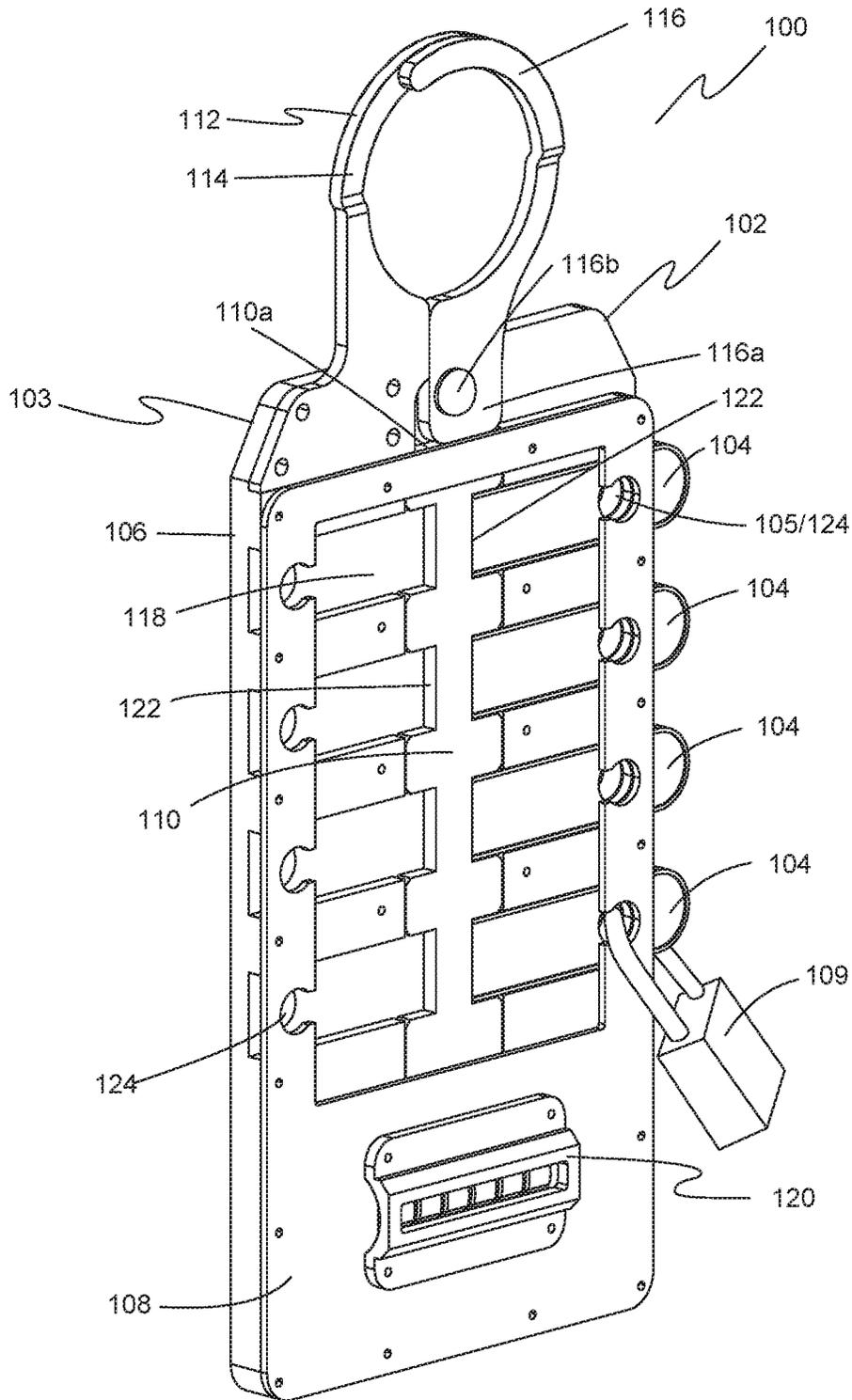


Figure 5

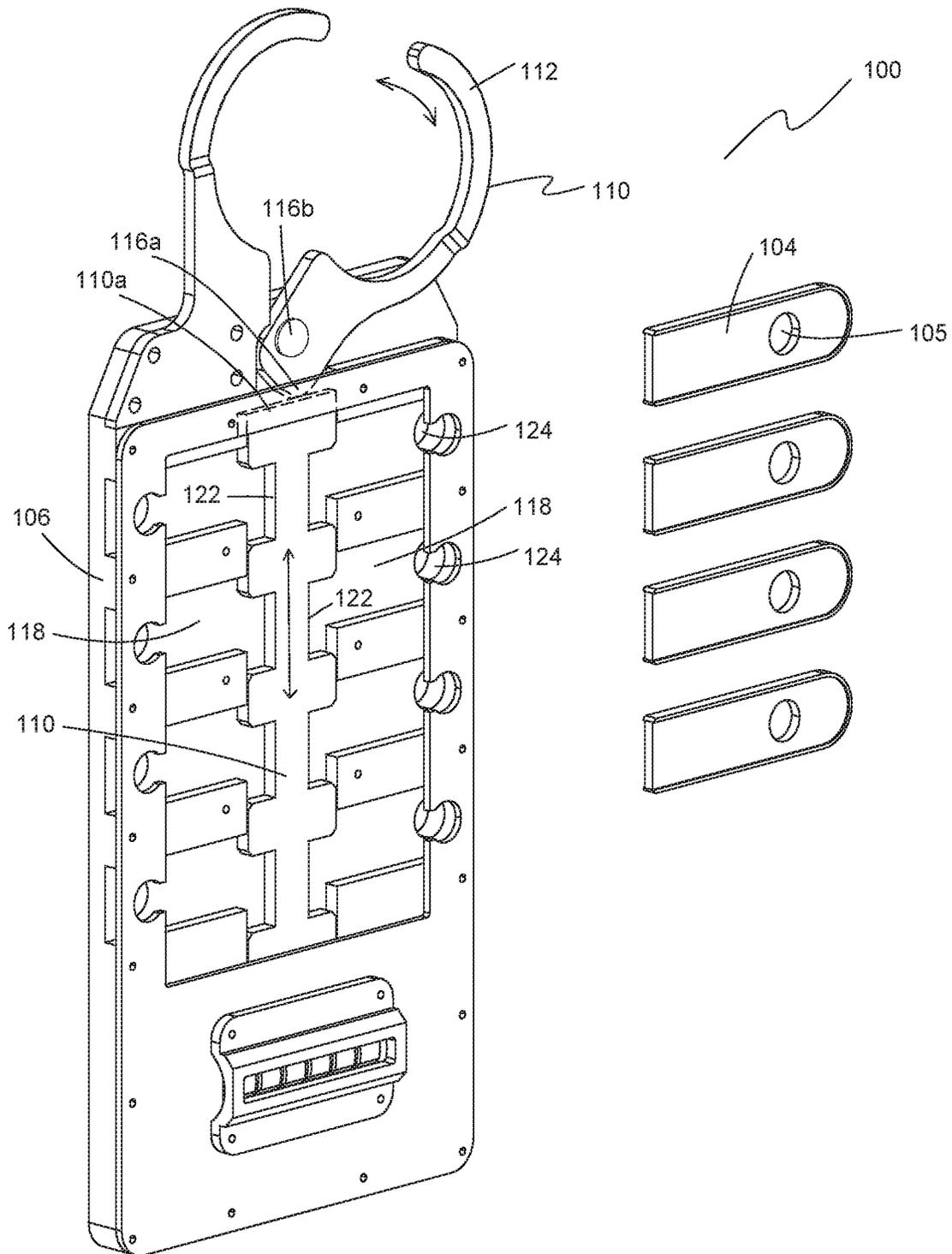


Figure 6

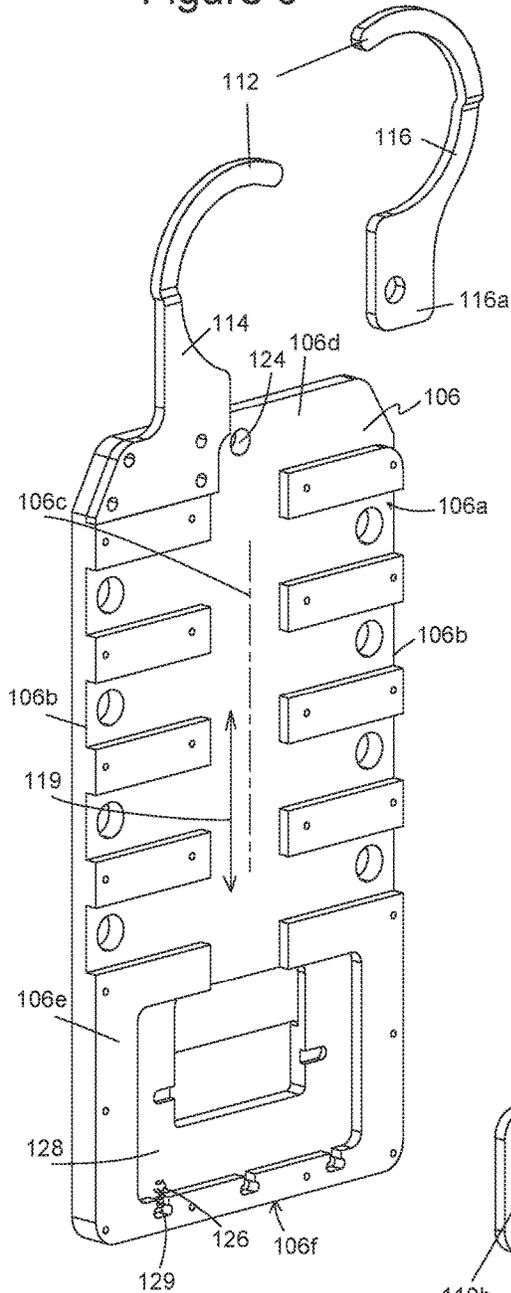


Figure 8

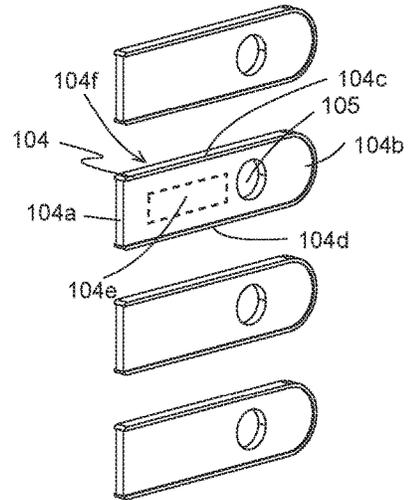


Figure 7

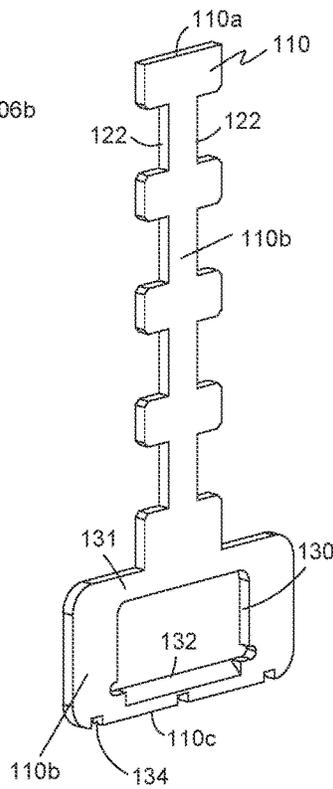


Figure 9

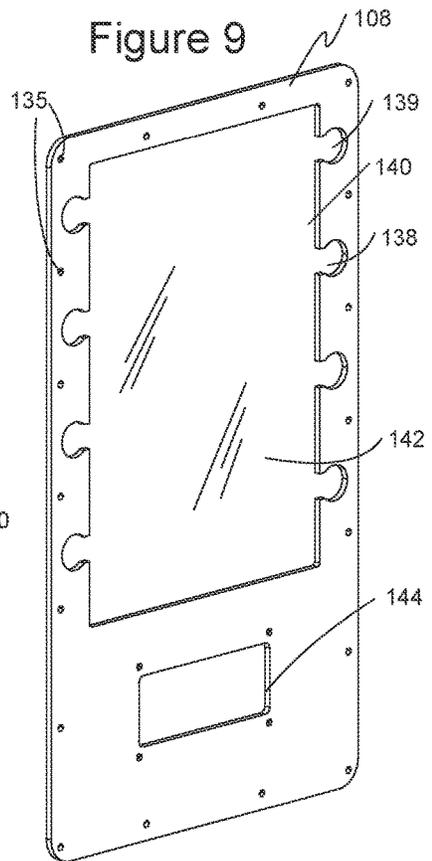


Figure 10

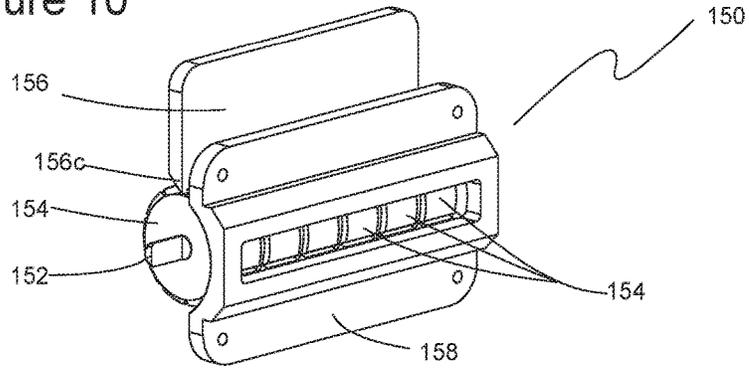


Figure 11

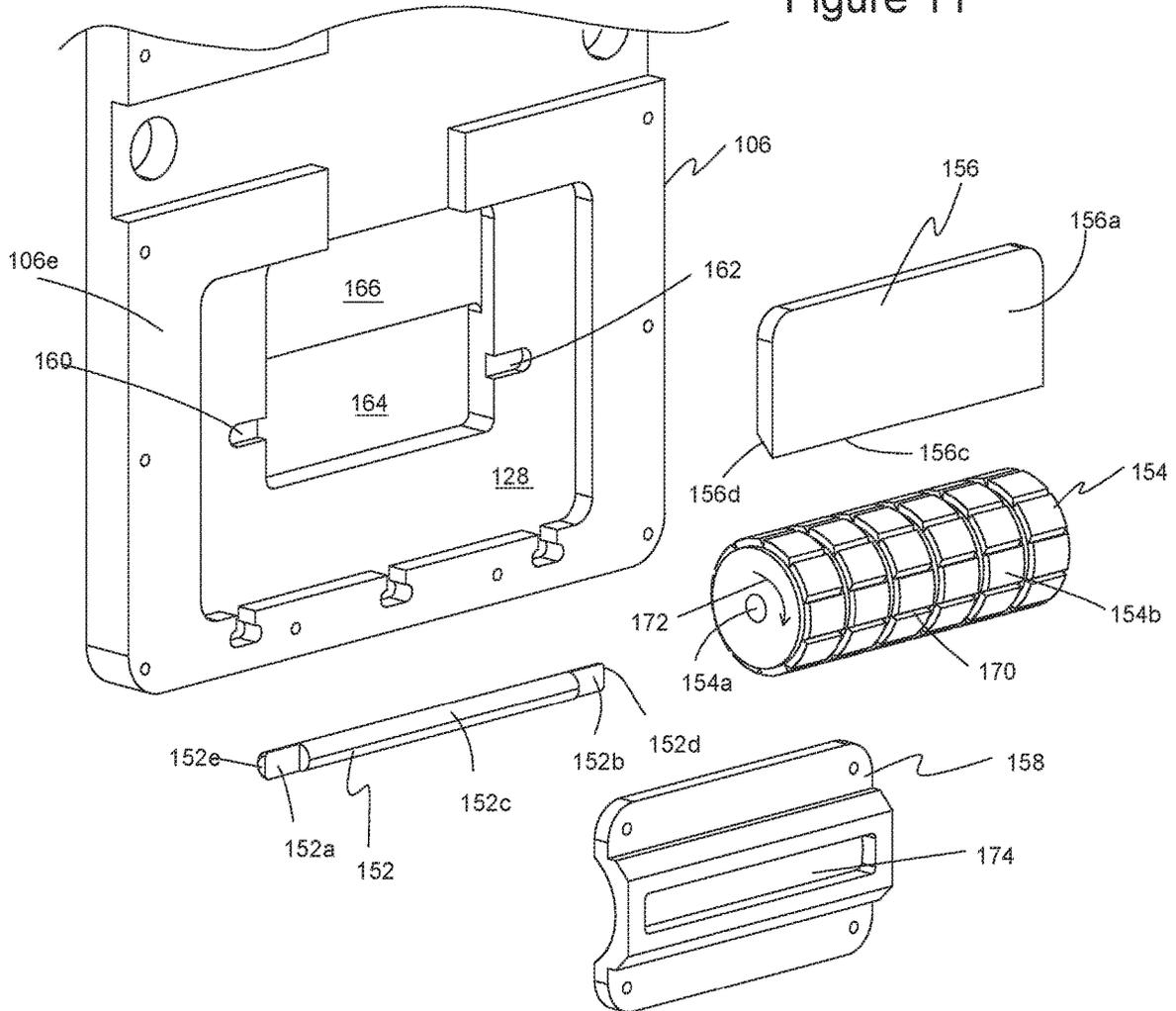


Figure 12

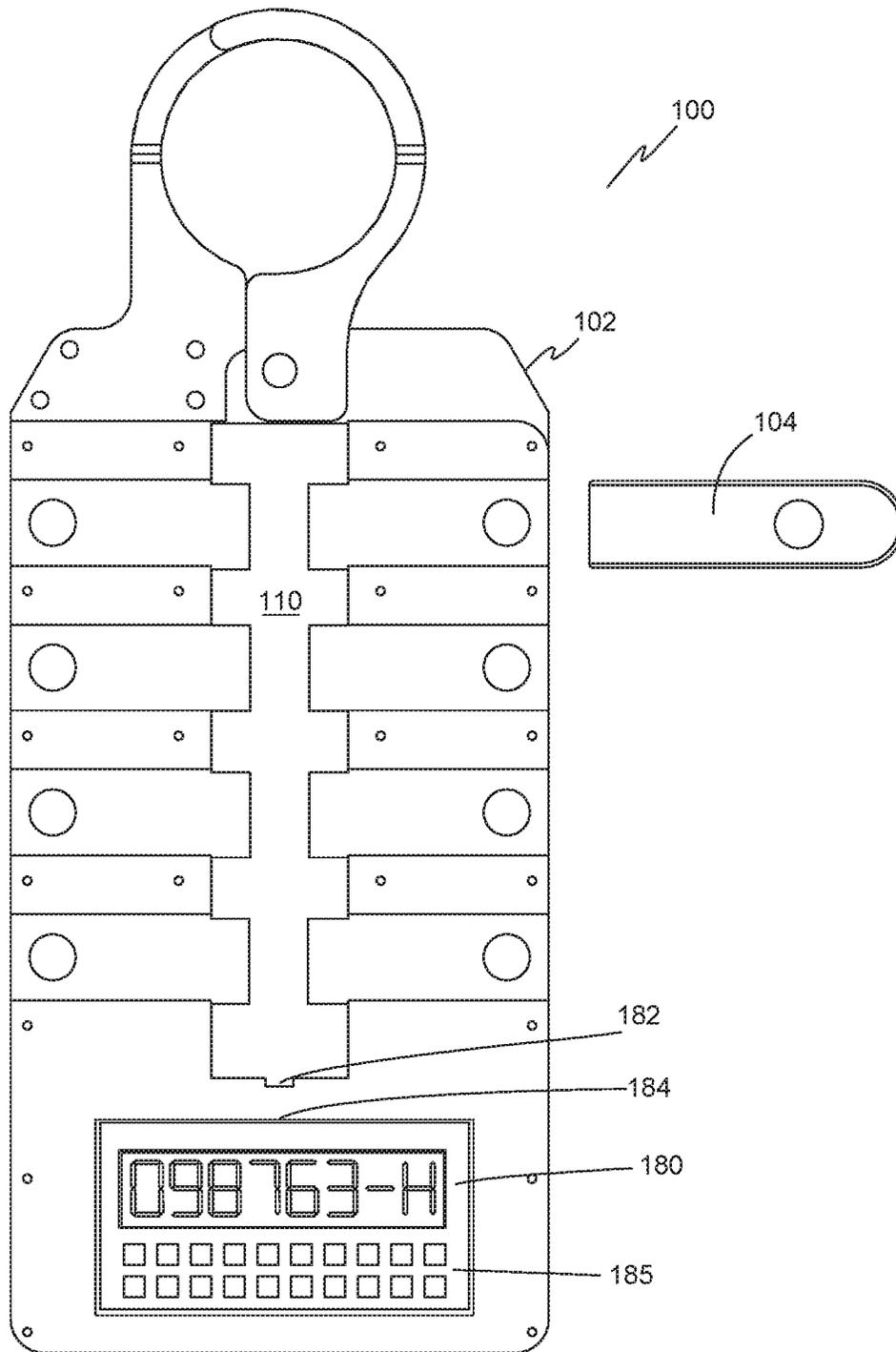


Figure 13

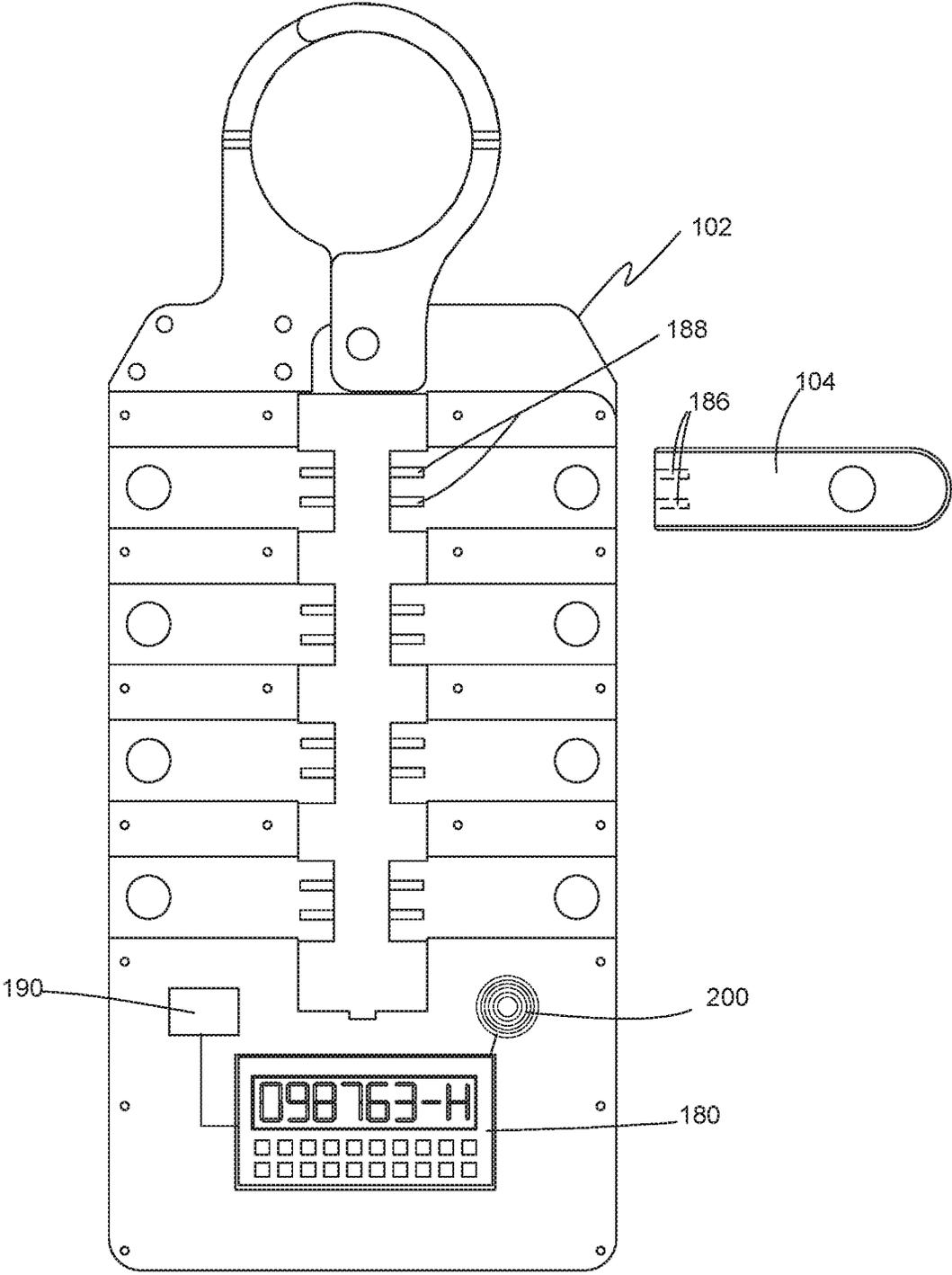


Figure 14

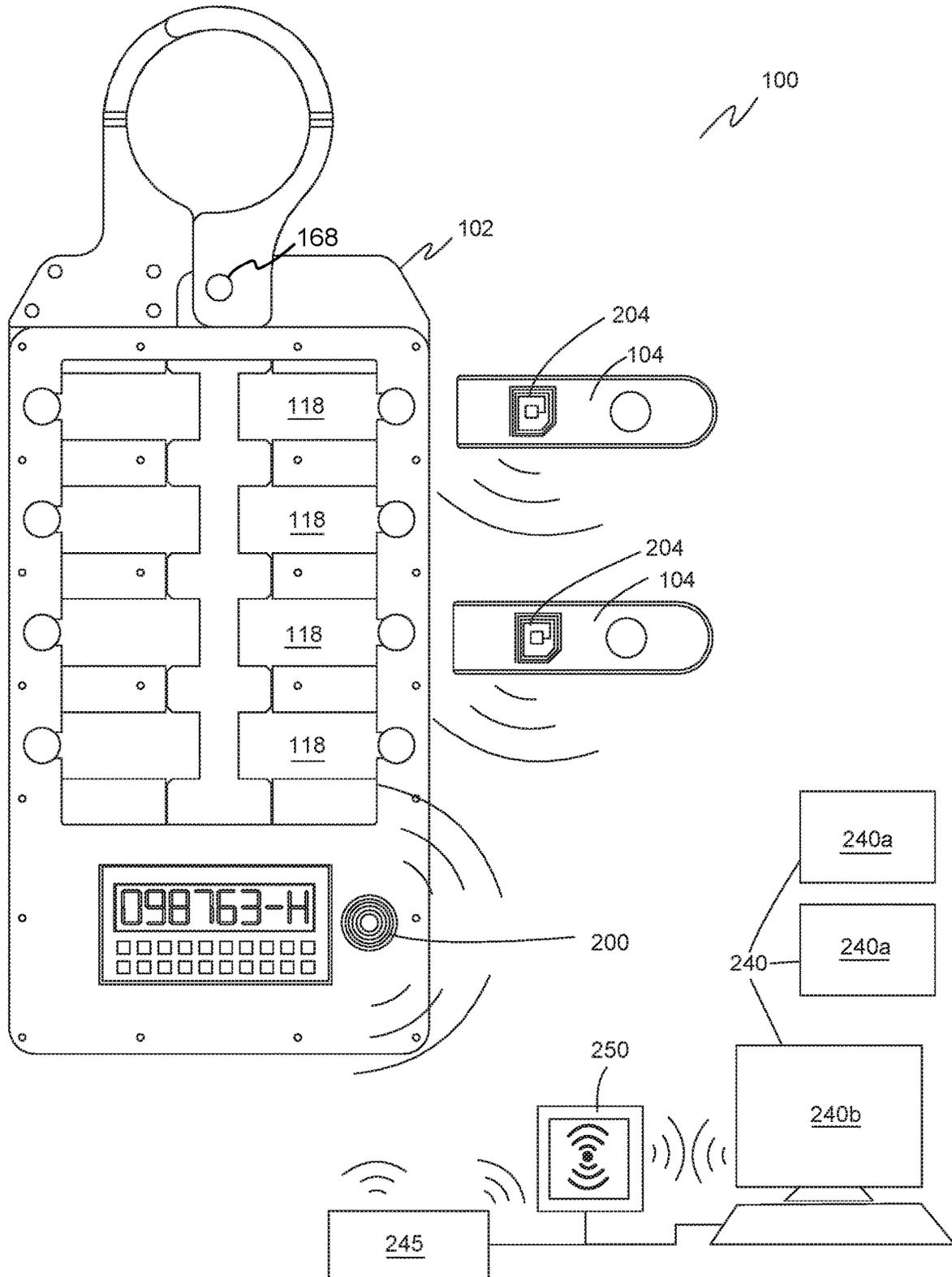


Figure 15a

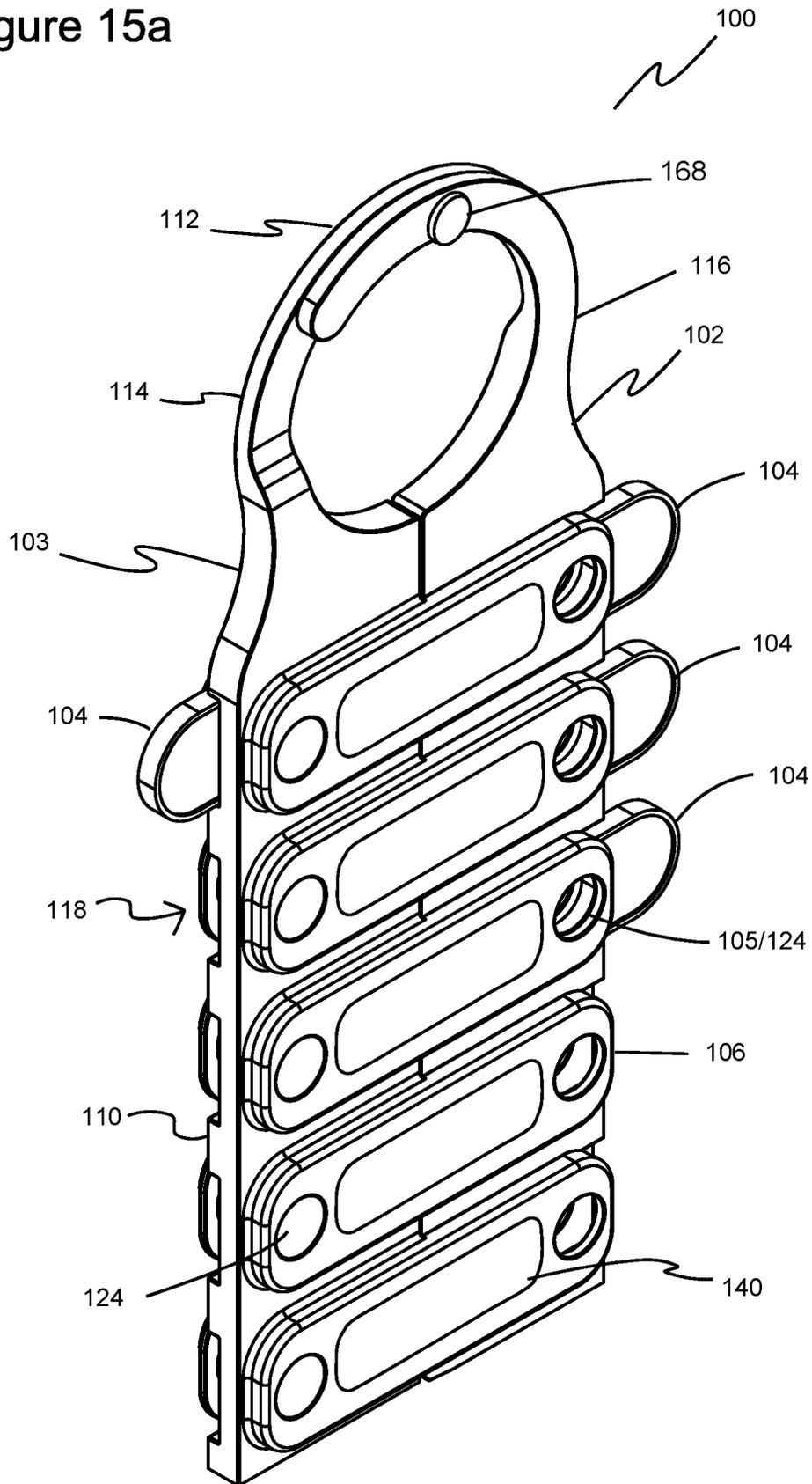


Figure 15b

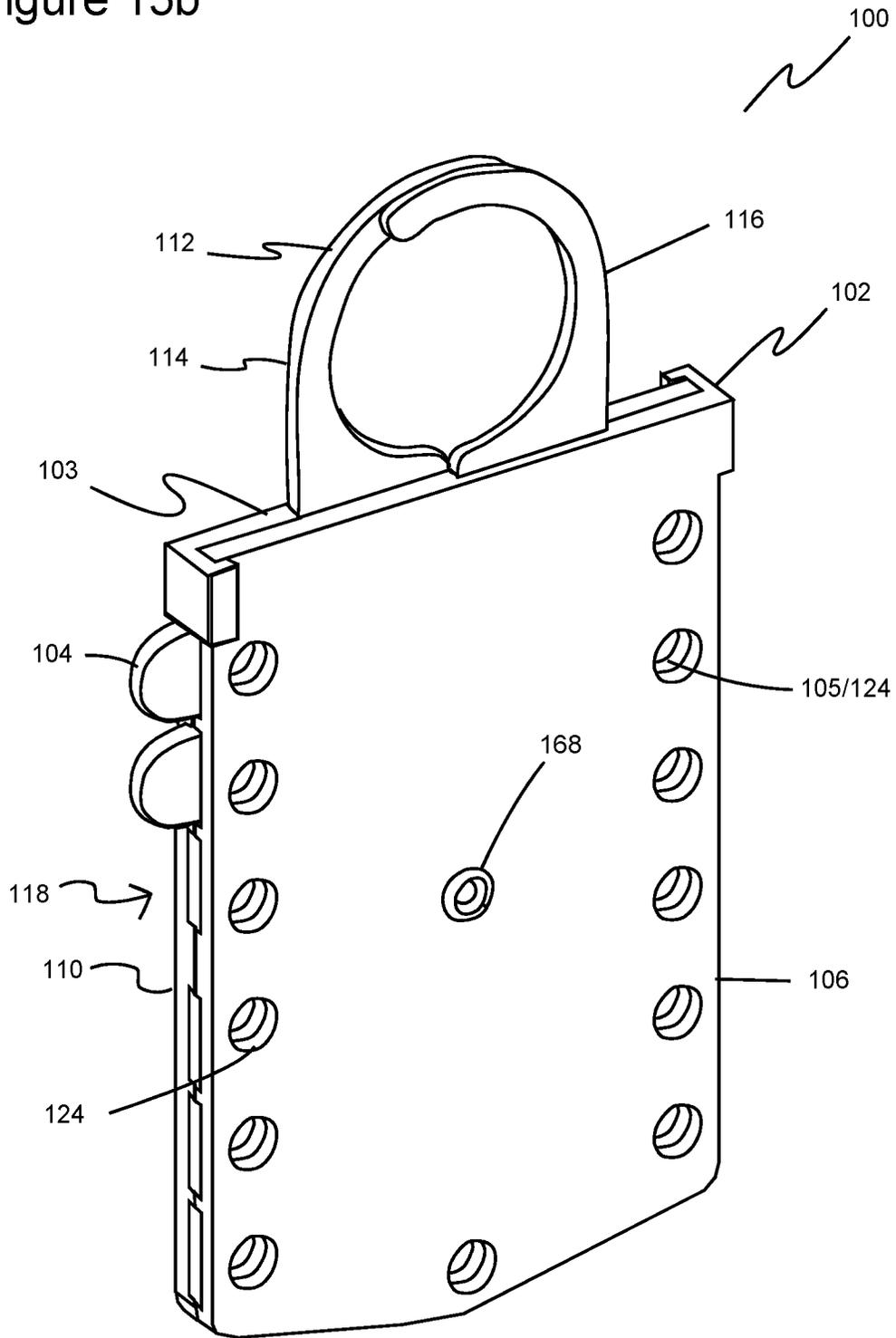


Figure 15c

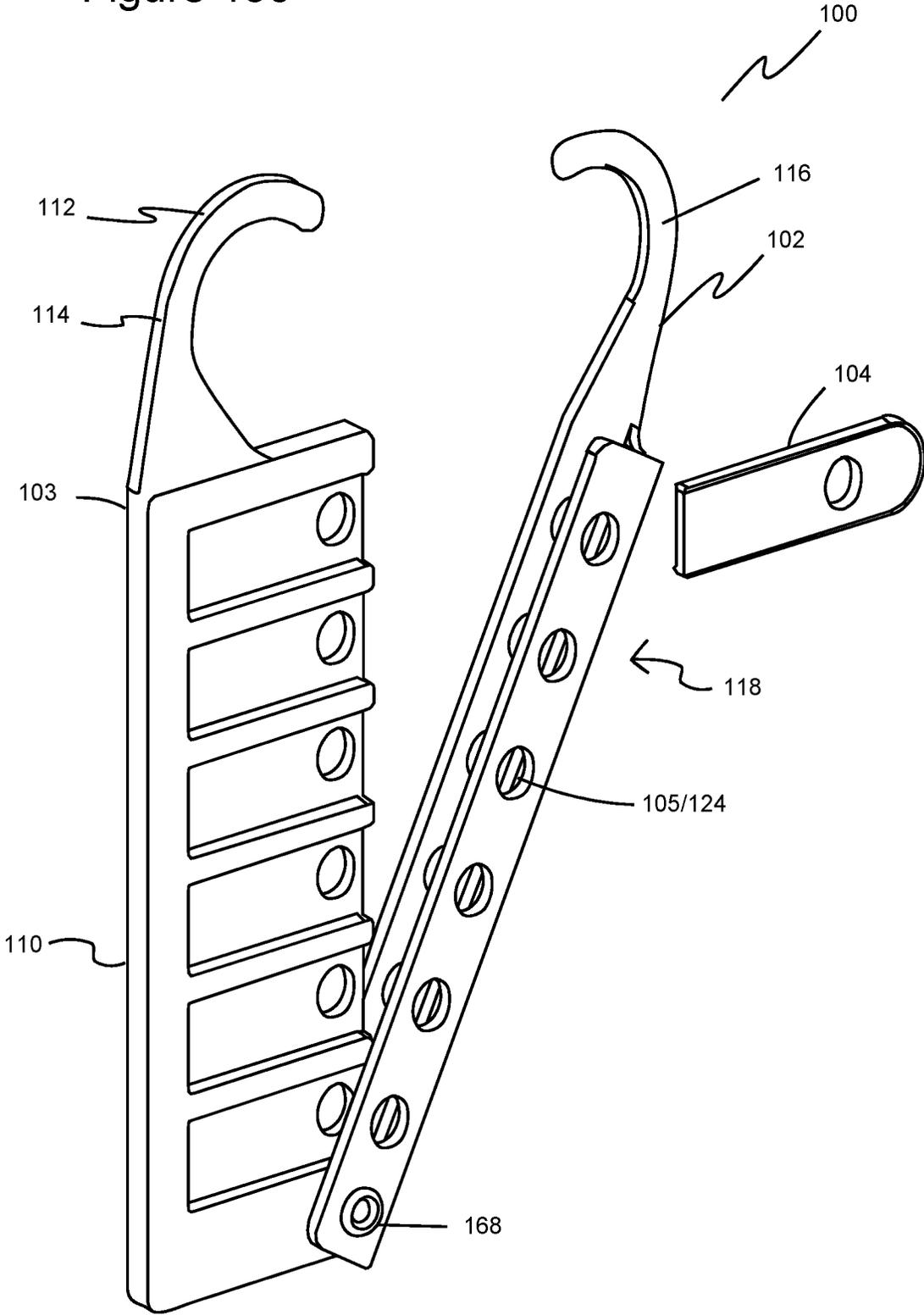


Figure 16

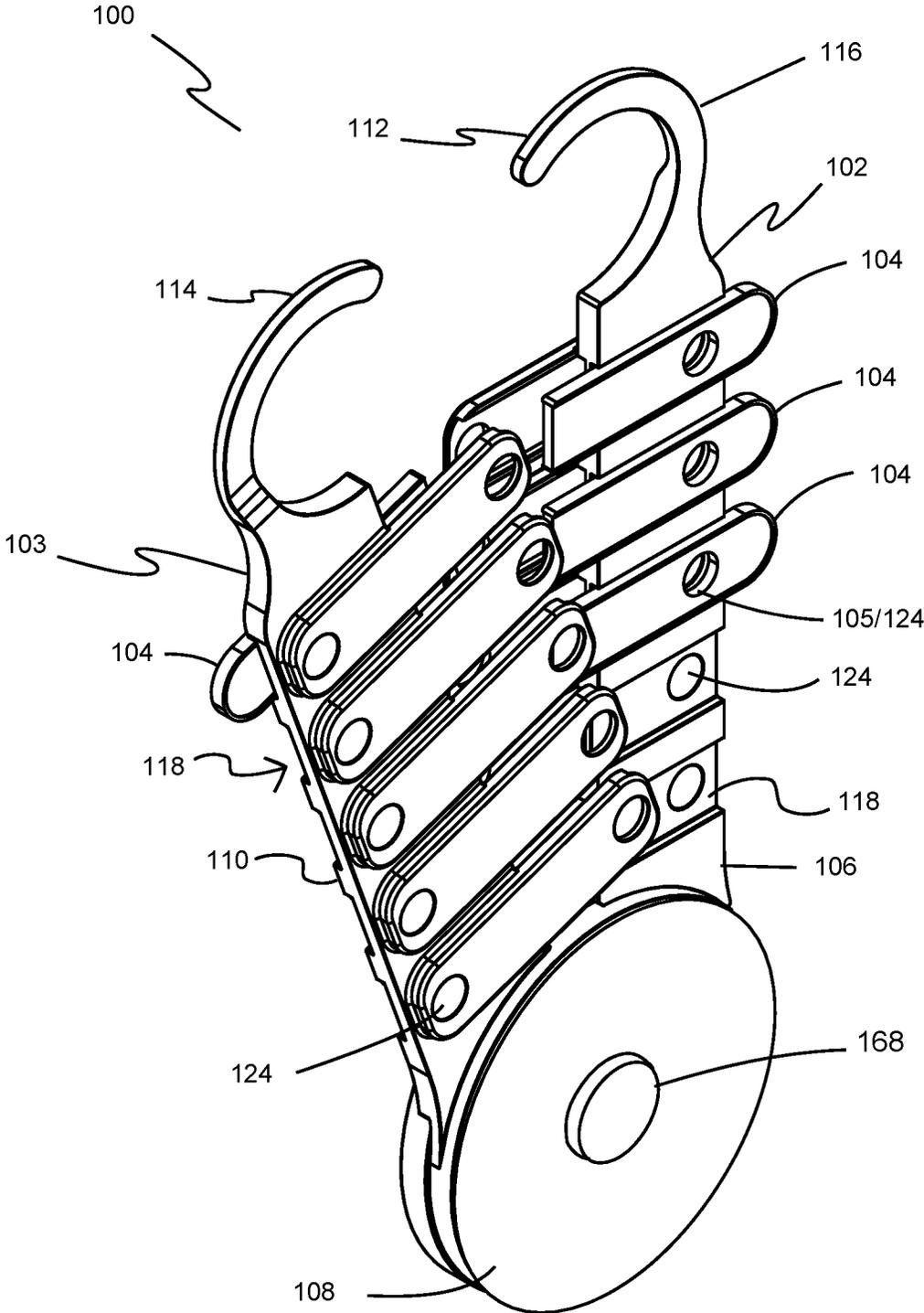


Figure 17

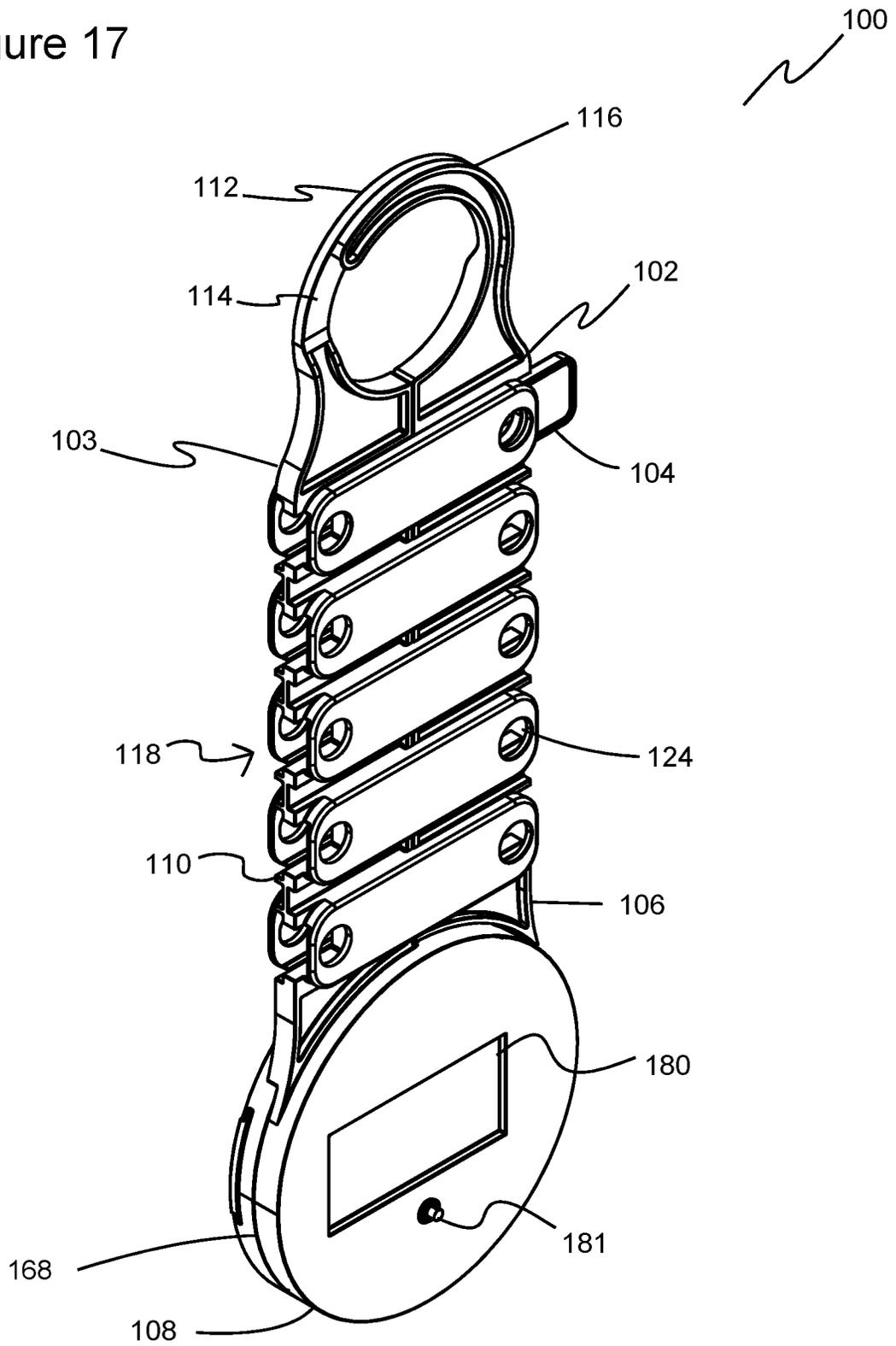


Figure 18

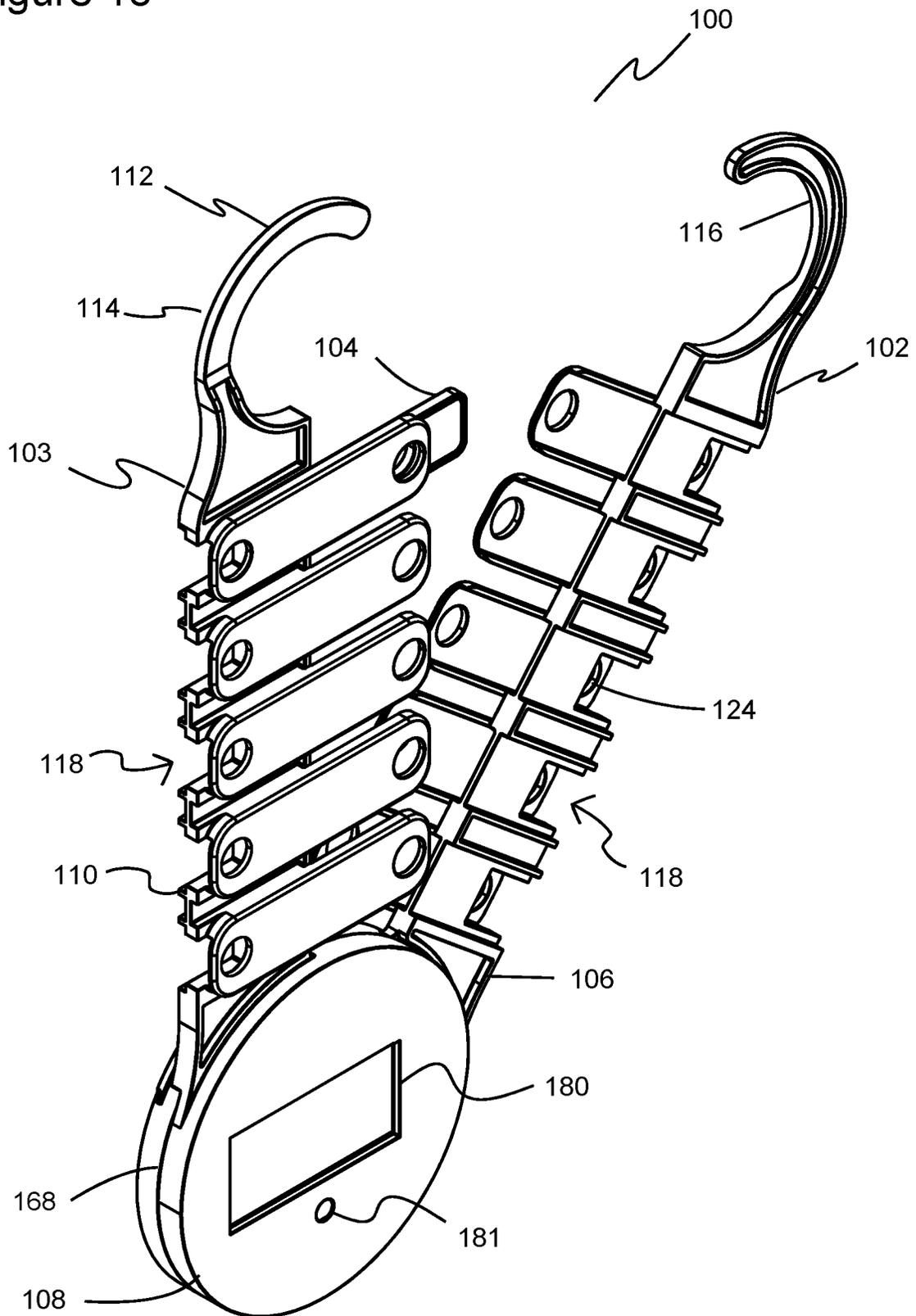


Figure 19

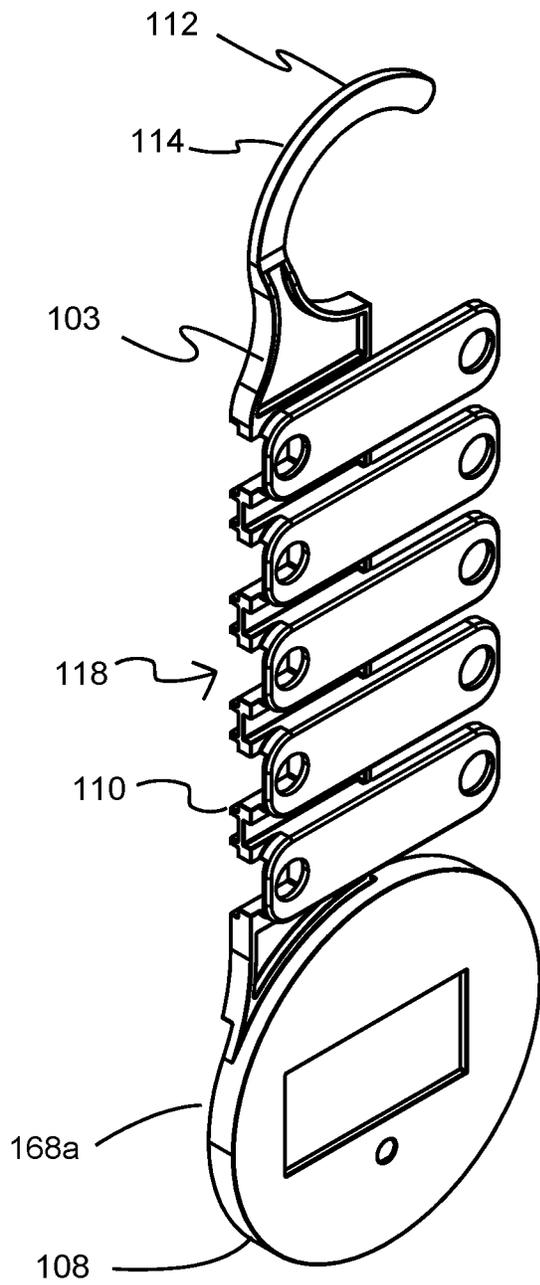


Figure 20

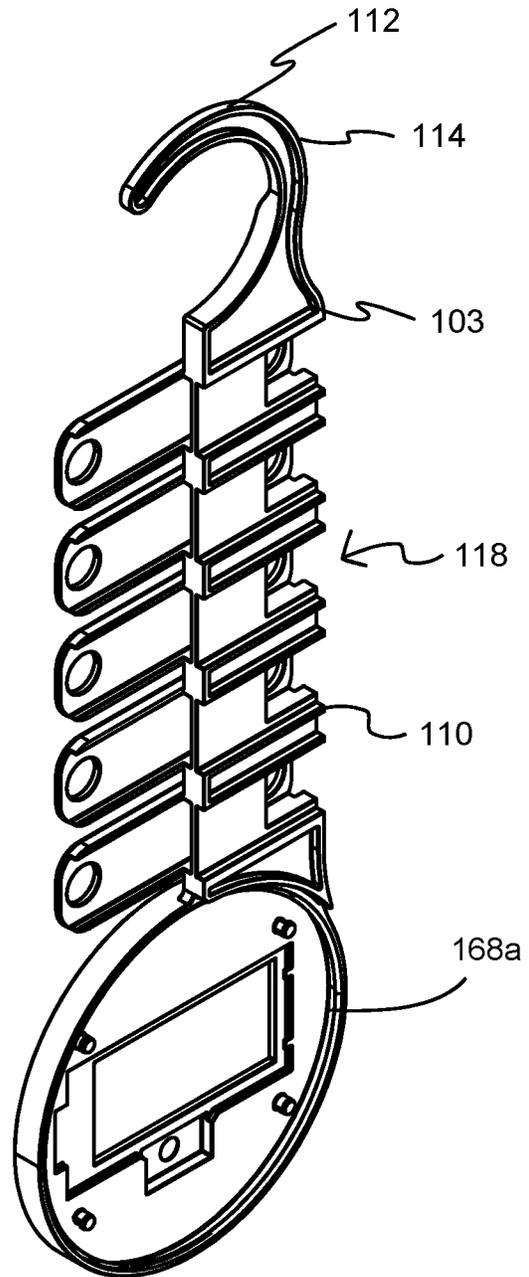


Figure 21

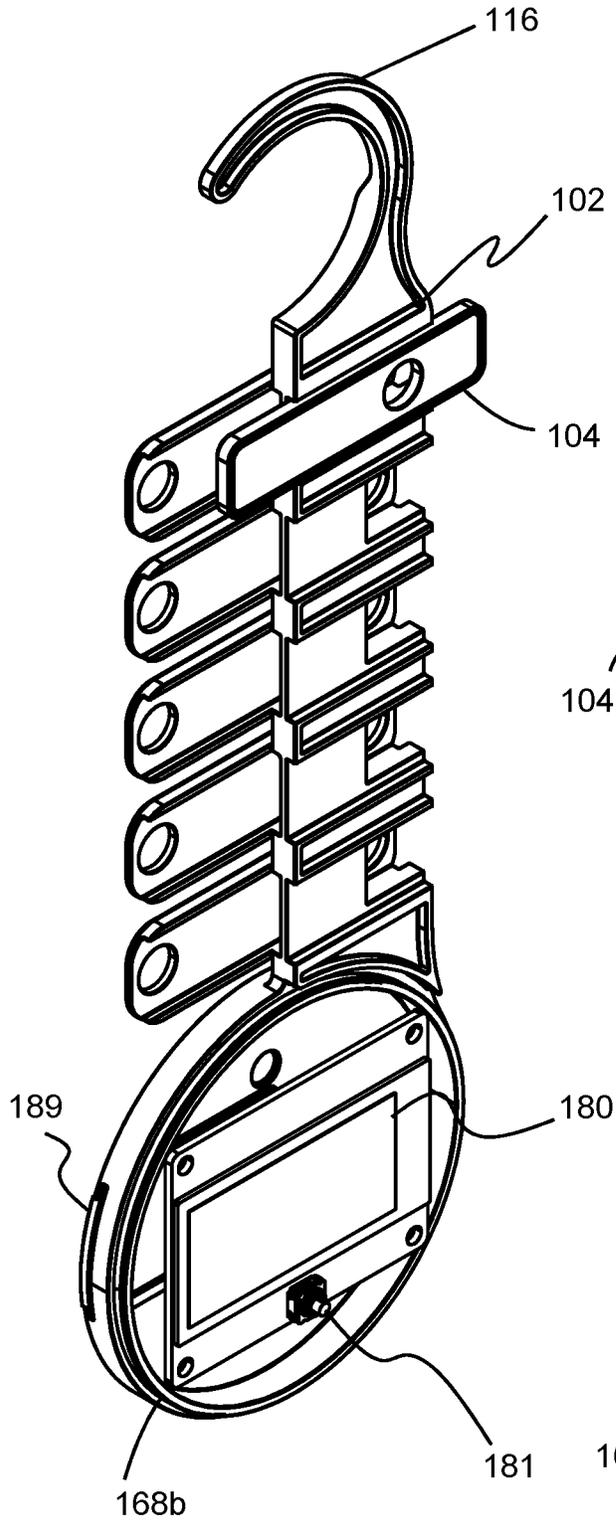


Figure 22

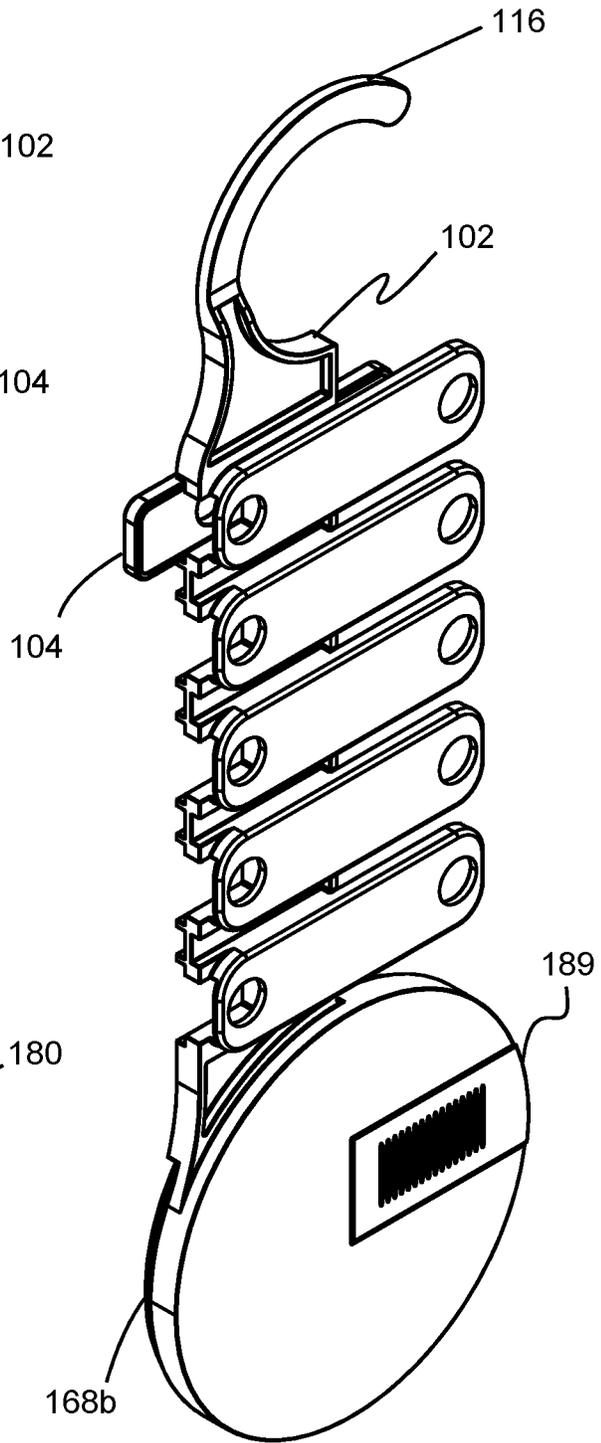


Figure 23

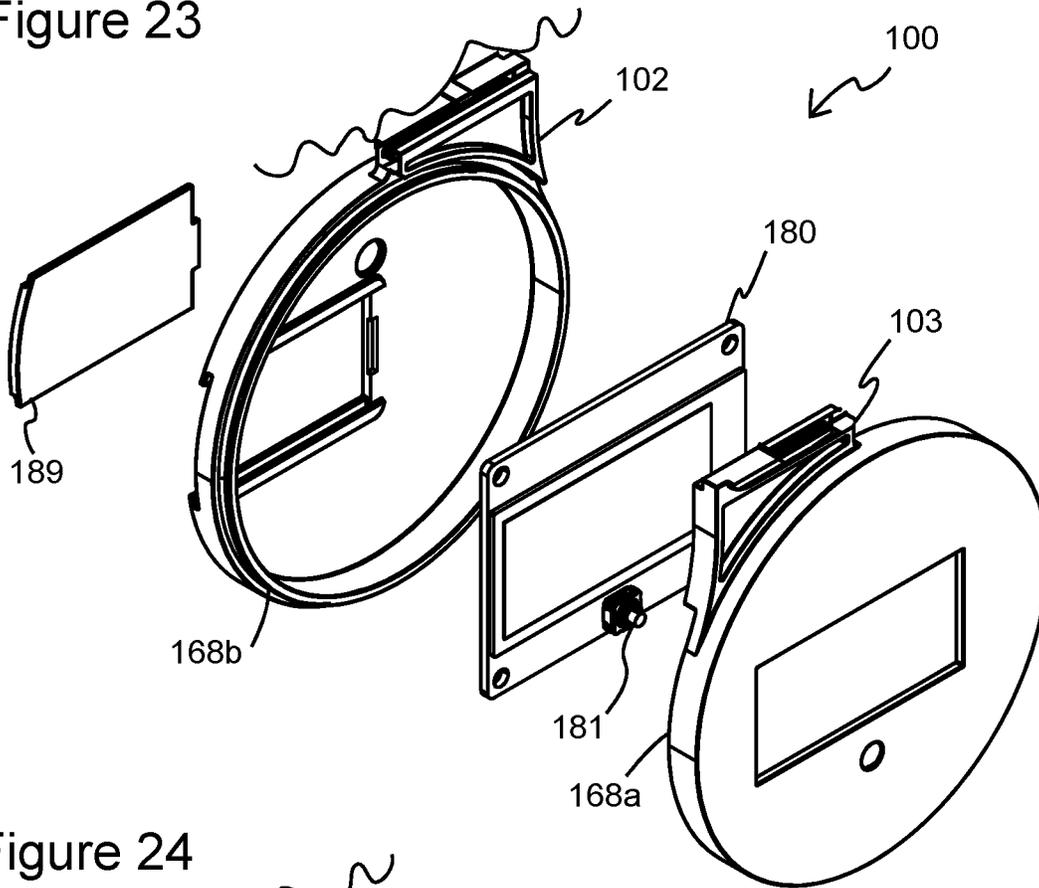


Figure 24

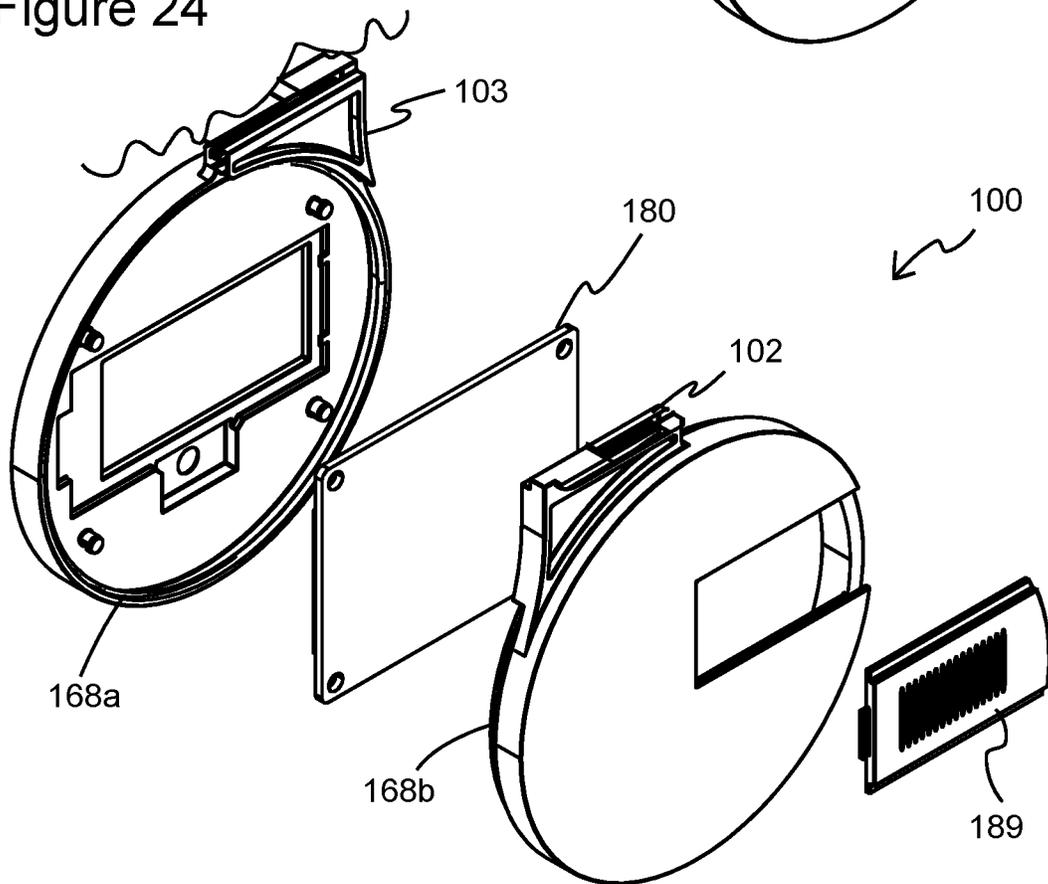


FIG. 25

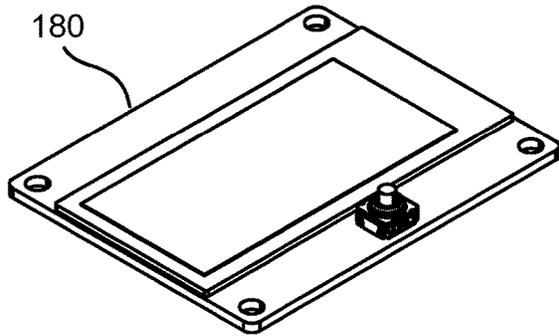


FIG. 25a



FIG. 25b

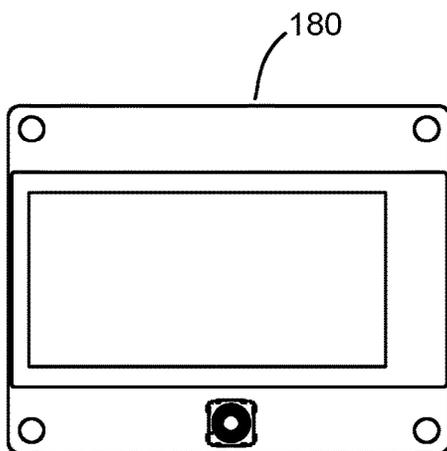
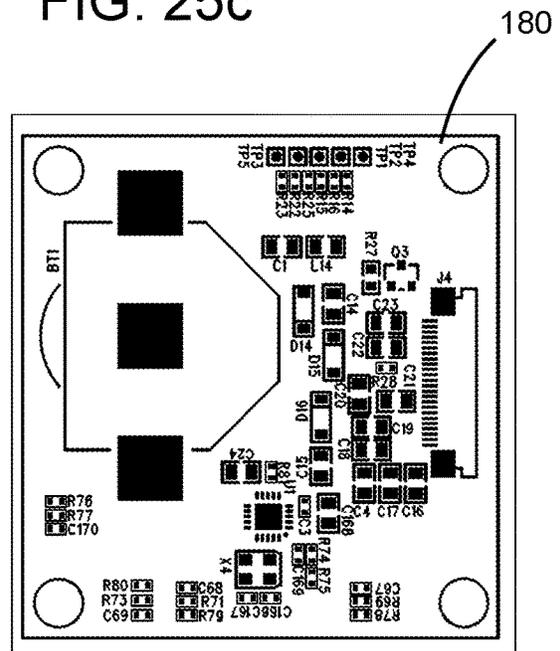


FIG. 25c



LOCKOUT SYSTEM FOR ENERGY SOURCES

This application is a continuation-in-part of nonprovisional application Ser. No. 15/785,582, filed on Oct. 17, 2017, which issued on Feb. 25, 2020, as U.S. patent application Ser. No. 10,570,644, which is a continuation of nonprovisional application Ser. No. 15/435,365, filed on Feb. 17, 2017, which issued on Jan. 30, 2018, as U.S. Pat. No. 9,881,749, which claims priority to provisional application No. 62/296,910, filed on Feb. 18, 2016.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to industrial safety devices. More particularly, the present invention relates to a lockout system and apparatus for use with industrial equipment and energy sources.

2. Description of the Prior Art

Energy sources in machines and equipment is a hazard to workers. Energy sources include electrical, mechanical, hydraulic, pneumatic, chemical, and thermal energy sources. Workers servicing or maintaining machines or equipment must properly control energy sources to avoid accidents. While servicing and maintaining machines and equipment, for example, an unexpected machine startup or release of stored energy can result in serious injury or death to workers. Injuries resulting from a failure to control hazardous energy during maintenance activities can be fatal and include burns, crush injuries, cuts, lacerations, amputations, and bone fractures.

For example, a steam valve opened automatically can burn workers who are repairing a downstream connection in the piping. A jammed conveyor system can suddenly release and crush a worker attempting to clear the jam. Internal wiring on factory equipment can electrically short, causing electric shock to the worker who is performing a repair.

Industrial workers, electricians, machine operators, and laborers are among the millions of workers who service equipment routinely and face the greatest risk of injury. A worker injured on the job from exposure to hazardous energy will require an average of 24 work days to recuperate from injuries. This recuperation time is costly in the form of lost productivity, medical expenses, lost revenue, other expenses, and as reduced morale after an accident.

To properly control hazardous energy and protect workers from these hazards, lockout/tagout (LOTO) practices and procedures have been established by the Occupational Safety and Health Administration (OSHA). OSHA's regulation is titled Control of Hazardous Energy and is published as 29 C.F.R. § 1910.147. This regulation outlines specific action and procedures for addressing and controlling hazardous energy during service and maintenance of machines and equipment used in general industry. Employers are required to train each worker to ensure that they know, understand, and are able to follow the applicable provisions of the hazardous energy control procedures. Requirements include knowing the purpose and function of the energy control program and having the knowledge and skills to safely apply, use, and remove energy control devices.

All employees who work in an area where energy control procedure is utilized need to be instructed in the purpose of and procedure to control energy, especially the prohibition

against attempting to restart or reenergize machines or other equipment that are locked or tagged. All employees who are authorized to lockout machines or equipment and perform the service and maintenance operations need to be trained to recognize hazardous energy sources in the workplace, the type and magnitude of energy found in the workplace, and the appropriate means and methods of isolating and/or controlling the energy.

Proper procedure for controlling energy includes using lockout/tagout devices to shut down equipment and machines for service or repair. FIG. 1 shows an example of a prior art lockout/tagout kit **10** that includes a hasp **12**, a plurality of tags **20**, and a plurality of locks **30**. Hasp **12** has two hasp parts **12a**, **12b**, each of which has a hook portion **14** and a body portion **16** with openings **17**. Hasp parts **12a**, **12b** rotate about a connector **18** between an open position and a closed position. In the closed position as shown in FIG. 1, the hook portions **14** are brought together to define a closed loop that may be installed through an equipment switch. In the closed position, the body portions **16** also overlap with the openings **17** aligned so that a lock **30** can be fastened through each opening **17** to prevent the hasp **12** from being opened. Each worker servicing a machine or piece of equipment will attach a lock **30** to the hasp **12** while servicing a machine. Each worker removes his lock **30** when his service has been completed. After all locks **30** have been removed, the machine is now available for use.

In the open position, hasp parts **12a**, **12b** rotate about connector **18** in opposite directions so that the hook portions **14** open and the body portions **16** move away from each other. When all locks **30** are removed from the hasp **12**, hasp parts **12a**, **12b** can be moved to the open position so the hasp **12** can be removed from the equipment.

FIG. 2 shows an example of a prior-art method of locking out a valve **24** with a hasp **12** attached to the valve lock **26** and secured with three locks **30** installed through body portions **16**. A tag **20** is installed on the pipe next to the valve being locked in a closed position. In many cases, each user installs a tag **20** on the lock **30** to identify the person who installed the lock **30** and the reason for doing so.

FIG. 3 shows another example of a prior-art method of locking an electrical switch **40** in an "off" position using a hasp **12** and locks **30**. With one or more locks **30** attached to the hasp **12**, the hasp **12** cannot be opened and removed from the switch **40**. Accordingly, the switch **40** cannot be operated because the hasp **12** blocks its movement to the "on" position.

SUMMARY OF THE INVENTION

The lockout/tagout kits **10** currently available generally function as intended to prevent turning on a machine, opening a valve, energizing a line or the like. However, these prior-art kits become unwieldy and inconvenient to use especially when multiple workers have locked a machine. A zip tie is often used to attach a name tag to a padlock that is secured to the hasp. When many workers install locks and tags on a hasp to lock out a piece of equipment, the access to the hasp is restricted and the general appearance of the lockout/tagout equipment is confusing and disorganized. The jumble of locks and tags is inconvenient to use, sometimes deterring workers from complying with lockout procedures. Also, it can be difficult to identify all of the workers who have locks on the hasp due to the disorganization of the locks and tags.

Also, workers find it uncomfortable and inconvenient to carry a tag and lock with them while on the job. This

inconvenience further discourages workers from following proper lockout/tagout procedure. Since compliance with procedure is essential for workplace safety, the current lockout/tagout equipment leaves room for improvement. Further, no system exists that allows a supervisor to remotely determine which pieces of equipment are locked and by whom. Therefore, what is needed is a lockout system and apparatus that is more convenient and efficient to use by workers.

Further, no lockout devices of the prior art provide wireless communication between the hasp assembly and a remote database or computer. Thus, a need exists for improved lockout systems.

It is an objective of the present invention to facilitate compliance with lockout/tagout procedure, therefore improving worker safety and reducing workplace accidents from stored energy sources. The present invention achieves these and other objectives by providing a lockout system and apparatus that includes a hasp assembly and a plurality of tags, where the hasp assembly can be retained in a locked position when one or more tags are received in the hasp assembly.

In one embodiment, each tag has an elongated shape with a first end and a second end. Each tag defines a tag opening. The hasp assembly includes a back plate defining a plurality of slots each sized and shaped to receive one of the plurality of tags and defining a plurality of back plate openings that align with the tag opening of each tag one or more tags are received in respective slots. A first hasp portion extends from an end of the back plate and defines a first portion of a closed loop. A longitudinal locking bar is slidable along the back plate and defines notches each sized and shaped to receive the first end of a tag. A second hasp portion is attached to the back plate and defines a second portion of the closed loop. Sliding the locking bar between an unlocked position and a locked position operates the second hasp portion between an open position and a closed position, respectively. In the closed position, the second hasp portion and the first hasp portion complete and define the closed loop. Tags may be made of metal, ABS plastic, or any other suitable material.

When the locking bar is in the closed position, one or more of the tags can be installed in respective slot or with the first end of the tag engaging a respective notch on the locking bar. When tags are received in the slots and engage the locking bar, the tag opening of each tag received in the slot is aligned with a respective back plate opening. As such, the tag openings and back plate openings align for securing the tag and hasp assembly together using a padlock or the like, thereby fixing the system in the closed position.

In one embodiment, the hasp assembly includes a front plate secured to the back plate and covering all or part of the slots. Entrance openings between the front plate and back plate receive tags into the slots. Thus, tags are slidably inserted through the entrance openings between the front plate and the back plate. In one embodiment, the front plate defines and frames a central open area. When the hasp assembly includes the front plate, the front plate is useful to retain the tags in the slots.

In another aspect of the present invention, a lockout system includes a plurality of tags each comprising an elongated plate with a first end and a second end, where tag defines a tag opening. A hasp assembly has a hasp body defining a plurality of slots, where each slot is sized and shaped to slidably receive one of the plurality of tags and defines a lock opening positioned to align with the tag opening of a respective tag received or installed in the slot. A first hasp portion defines a first closed loop portion and

extends from an end portion of the hasp body. A locking bar is slidable along the hasp body between an unlocked position and a locked position. The locking bar defines a plurality of notches each sized and shaped to matingly receive the first end of one of a tag, where the notches align with the slots when the locking bar is in the locked position and the slots are offset from the notches when the locking bar is in the unlocked position. A second hasp portion is movably attached to the hasp body and defines a second closed loop portion. The second hasp portion moves between an open position in which the locking bar is the unlocked position, and a closed position in which the locking bar is in the locked position. The second hasp portion and the first hasp portion complete and define the closed loop when the second hasp portion is in the closed position. Installing one or more tags in slots of the hasp assembly prevents the second hasp portion from moving to the open position.

In another embodiment, the hasp assembly includes a back plate defining the plurality of slots and a front plate aligned with and secured to the back plate to define entrance openings between the back plate and the front plate for each slot.

In another embodiment, the hasp assembly includes a tumbler assembly in the hasp body. The tumbler assembly may be used to set a date. In one embodiment, the tumblers are locked in position when the hasp is in the closed position.

In another embodiment, the hasp assembly includes an electronic display on the hasp body, where the electronic display is configured to recognize the presence of one or more tags installed in the hasp assembly. In one embodiment, each slots has electrical slot contacts that are coupled to the electronic display. Each tag has electrical tag contacts, where any tags installed in the hasp body results in a completed circuit with the electronic display's processor. In another embodiment, each tag has a transmitter circuit and the electronic display has a transceiver circuit. Each tag communicates wirelessly with the transceiver circuit when the tag is installed in the hasp assembly.

In another embodiment, the system includes a database disposed in communication with the hasp assembly and one or more computers are disposed in communication with the database. The hasp assembly communicates lockout information to the database and each computer is configured to display the lockout information to a user. In one embodiment, for example, the lockout information includes data selected from a lockout status, a tag identifier, a lockout date, a tag removal date, a worker identifier, a work code, and a slot identifier.

In another aspect of the present invention, a lockout system includes one or more hasp assembly, a plurality of ID tags, and one or more computer. Each hasp assembly includes a hasp body defining a plurality of tag slots each having a lock opening, a hasp connected to and extending from the hasp body and operable between an open hasp position and a closed hasp position, and a locking bar movable along the hasp body portion between a locking position and an unlocking position. Moving the locking bar to the locking position moves hasp to the closed hasp position and moving the locking bar to the unlocking position moves the hasp to the open hasp position. The hasp assembly also has an electronic display on the hasp body, where the electronic display has a processor and a transceiver circuit. Each ID tag has a first end portion and a second end portion that defines a tag opening. Each ID tag is configured to be removably installed in any of the plurality of tag slots with the first end portion engaging the locking

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bar and the tag opening aligned with a corresponding lock opening. When an ID tag is installed in the hasp body, the locking bar is prevented from moving to the unlocking position, thereby preventing the hasp from changing to the open hasp position. When an ID tag is installed in the hasp body each of the plurality of ID tags communicates a tag identifier to the electronic display. Each computing device is disposed in wireless communication with the transceiver circuit and is configured to communicate wirelessly with the transceiver circuit and display to a user the data transmitted by the transceiver circuit.

In another embodiment, the lockout system includes a padlock with a padlock hasp sized to extend through the lock opening and corresponding tag opening of one of the plurality of ID tags installed in the hasp body.

In another embodiment, the lockout system includes a transmitter circuit disposed on each of the plurality of ID tags, where the transmitter circuit is configured to communicate wirelessly with the transceiver circuit when the ID tag is installed in the tag slot of the hasp assembly.

In another embodiment, the lockout system includes electrical slot contacts in each of the plurality of tag slots and each ID tag has electrical tag contacts, where the electrical slot contacts and the electrical tag contacts are configured to align and engage when an ID tag is installed in one of the plurality of tag slots.

Another aspect of the present invention is directed to a method of locking an energy source comprising the steps of providing a hasp assembly defining a plurality of tag slots each defining a lock opening, where the hasp assembly has an openable hasp and a locking bar operable with the openable hasp by moving between a locked position and an unlocked position, the locking bar defining a plurality of notches configured to align with respective ones of the plurality of tag slots when the locking bar is in the locked position; providing a plurality of tags each defining a tag opening and configured to be removably installed in one of the tag slots with a first end portion of the tag sized to be received in one of the notches and the tag opening aligned over a lock opening; moving the locking bar to the unlocked position, thereby opening the openable hasp; installing the hasp through a lock opening on an energy source to be locked; moving the locking bar to the locked position, thereby closing the openable hasp and aligning the notches in the locking bar with the tag slots; installing one or more tags into the hasp assembly with each first end portion received in one of the notches and the tag opening aligned over a corresponding lock opening; providing one or more padlocks each having a padlock hasp sized to extend through the tag opening of a tag and through the corresponding lock opening of a tag slot; and locking one padlock with the padlock hasp extending through the tag opening and the corresponding lock opening, thereby preventing the one of the plurality of tags tag from being removed from the corresponding tag slot, preventing the locking bar from moving to the unlocked position, and locking the hasp in the closed position.

In another embodiment, the method also includes the steps of providing a computer with a display device and configured for wireless communication; selecting the hasp assembly to include a transceiver circuit disposed in communication with the computer and configured to detect the presence of one or more tags installed in the hasp assembly; selecting the tags configured to communicate a unique tag ID to the transceiver circuit when installed in the hasp assembly; the transceiver circuit receiving data from one or more tags installed in the hasp assembly; the transceiver

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circuit transmitting data to the computer in response to receiving data from one or more tags; the computer receiving data transmitted by the transceiver circuit; and the display device displaying to a user the data transmitted by the transceiver circuit.

In another embodiment of the method, data transmitted by the transceiver circuit includes one or more item selected from a unique tag ID, an energy source identifier, a worker identifier, a lockout date, a tag installation date, a tag removal date, and a lockout status identifier.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a photo showing an example of a prior-art lockout/tagout kit that includes a hasp, tags, and a lock with keys.

FIG. 2 is a photo of a prior-art lockout/tagout kit in use on a valve.

FIG. 3 is a photo of another prior-art lockout hasp in use with locks on an electrical panel.

FIG. 4 illustrates a perspective view of one embodiment of a lockout system of the present invention showing the lockout system in a closed position.

FIG. 5 illustrates the lockout system of FIG. 4 showing the lockout system in an open position with tags removed from the hasp assembly.

FIG. 6 illustrates one embodiment of a back plate and hasp of the present invention.

FIG. 7 illustrates one embodiment of a locking bar of the lockout system of the present invention.

FIG. 8 illustrates a group of tags of the present invention.

FIG. 9 illustrates a front plate of the lockout system of the present invention.

FIG. 10 illustrates an optional tumbler assembly of the present invention.

FIG. 11 illustrates the tumbler assembly of FIG. 10 shown in an exploded view with a portion of the back plate.

FIG. 12 illustrates a front elevational view of another embodiment of a hasp assembly of the present invention showing an electronic display.

FIG. 13 illustrates a front elevational view of another embodiment of a hasp assembly of the present invention showing an electronic display and electrical contacts to complete a circuit between the display's processor and tags installed in the hasp assembly.

FIG. 14 illustrates an embodiment of a lockout system of the present invention showing a hasp assembly with transceiver circuit, tags with a transmitter circuit, computers, a database, and a wireless network router.

FURTHER EMBODIMENTS

FIG. 15 illustrates a further embodiment of a lockout system of the present invention showing an alternative hasp assembly with slots for tags on the front and back of the system.

FIG. 15a illustrates an embodiment of a lockout system with slots for tags on the front and back of the system, in a closed position with tags, requiring at least one padlock to remain in a locked position.

FIG. 15b illustrates an embodiment of a lockout system of the present invention, with slots for tags on the left and right, requiring at least one padlock to remain in a locked position.

FIG. 15c illustrates an embodiment of a lockout system of the present invention in an open position, having a reduced device area, with slots for tags on the left, requiring at least one padlock to remain in a locked position.

FIG. 16 illustrates the lockout system of FIG. 15 in an open position showing multiple tag locations along the front and back.

FIG. 17 illustrates another embodiment of a lockout system of the present invention having a hasp assembly of the present invention showing an electronic display; user input button; and battery cover.

FIG. 18 illustrates the lockout system of FIG. 17 in an open position, the first hasp portion rotated with respect to the second hasp portion about the pivoting connection which houses the electronic components.

FIG. 19 illustrates the front perspective view of the first hasp portion of the lockout system of FIG. 17.

FIG. 20 illustrates the rear perspective view of the first hasp portion of the lockout system of FIG. 17.

FIG. 21 illustrates the front perspective view of the second hasp portion of the lockout system of FIG. 17 with electronic components in place.

FIG. 22 illustrates the rear perspective view of the second hasp portion of the lockout system of FIG. 17.

FIG. 23 illustrates an exploded partial front perspective view of the lockout system of FIG. 17, focusing on the pivoting connection housing the electronic components.

FIG. 24 illustrates an exploded partial rear perspective view of the lockout system of FIG. 17, again focusing on the pivoting connection housing the electronic components.

FIGS. 25-25C illustrate various components of the electrical components of FIG. 17.

DETAILED DESCRIPTION

Exemplary embodiments of the present invention are illustrated in the following figures. FIG. 4 illustrates a perspective view of one embodiment of a lockout system 100 of the present invention that includes a lockable hasp assembly left side 102 and a plurality of tags 104 that can be independently received by and removed from hasp assembly 100.

One embodiment of lockout system 100 has a left side of hasp assembly body 102 and right side of hasp assembly body 103. The lockout system 100 includes a back plate 106 and a front plate 108 attached to the back plate 106. A locking bar 110 is slidable between back plate 106 and front plate 108. A completed hasp 112 is attached to the assembly body and includes a first hasp jaw 114 and a second hasp jaw 116 operable between an open position and a closed position in response to movement of the locking bar 110 from an unlocked position to a locked position, respectively.

As discussed in more detail below, locking bar 110 in one embodiment slides along body portions 102, 103 in engagement with second hasp jaw 116, thereby causing second hasp jaw 116 to pivot or move relative to first hasp jaw 114 to open or close hasp 112. Lockout system 100 of FIG. 4 is shown with hasp 112 and locking bar 110 in the closed position with tags 104 received in body portions 102, 103 and with tag openings 105 aligned with lock openings 124 in body 103. In this condition, a padlock 109 or the like may be installed through tag(s) 104 and body portions 102, 103 to prevent removal of tag(s) 104. Accordingly, lockout system 100 is secured in the closed position until all tags 104 have been removed from hasp assembly 100. As illustrated, hasp assembly 100 is constructed to receive up to eight tags 104; however, each hasp assembly 100 may have more or fewer slots 118.

In some embodiments, the hasp assembly 100 optionally includes an adjustable tumbler assembly 120 useful to communicate a lockout date or other information to the user.

Tumbler assembly 120 is discussed in more detail below with reference to FIGS. 10 and 11.

Each body portion 102, 103 defines a plurality of channels or tag slots 118, each of which is sized and shaped to slidably receive one tag 104. As shown in FIG. 4, tag slots 118 are channels machined or formed into back plate 106, where tag slots 118 extend horizontally along body 103 when hasp 112 is positioned at the top of lockout system 100. Front plate 108 is attached to back plate 106 to partially close tag slots 118 and prevent removal of tags 104 except by sliding along back plate 106 in a direction away from locking bar 110.

In some embodiments, tag slots 118 may be formed with an overhang, rail, or other feature that engages each tag 104 and requires installation and removal of tags 104 only by sliding tags 104 along tag slots 118 towards or away from locking bar 110. In such an embodiment, front plate 108 may be optional since it is not needed to retain tags 104 in tag slots 118. Similarly, back plate 106 may be formed with features that engage locking bar 110 to permit it to slide along back plate 106 towards or away from hasp 112, yet without being removed from back plate 106.

When tags 104 are installed fully into tag slot 118 and into recess 122 of locking bar 110, each tag opening 105 aligns with lock opening 124 in back plate 106. Each lock opening 124 may also extend through front plate 108 depending on the location of lock opening 124 and geometry of front plate 108, if present. Each slot 106 intersects a path of locking bar 110, which slides along back plate 106 to operate hasp 112 between an open position and a closed position.

In the closed position shown in FIG. 4, upper end 110a of locking bar 110 abuts or is closely adjacent a base portion 116a of second hasp jaw 116, thereby providing a physical barrier that prevents its rotation about fastener 116b. When one or more tags 104 are installed in tag slots 118 and extend into recesses 122 of locking bar 110, tag(s) 104 intersect the sliding path of locking bar 110 towards or away from hasp 112 to lock the position of locking bar 110. However, to permit tags 104 to engage recesses 122, locking bar 110 must be in the closed position so that tag slots 118 and recesses 122 align and allow tag(s) 104 to extend into recesses 122. Thus, when one or more tags 104 are inserted into tag slots 118 with locking bar 110 in the closed position, locking bar 110 and second hasp jaw 116 are prevented from moving out of the closed position. A padlock 109 is installed through tag opening 105 and lock opening 124 of one of the tags 104 to secure the tag 104 in hasp assembly 100.

Referring now to FIG. 5, lockout system 100 is shown with tags 104 removed from body 103, locking bar 110 moved away from hasp 112 to the unlocked position, and second hasp jaw 116 pivoted about fastener 116b to the open position. In doing so, base portion 116a of second hasp jaw 116 engages upper end 110a of locking bar 110 and forces it to slide away (e.g., downward) from hasp 112. In the open position, recesses 122 of locking bar 110 are not aligned with tag slots 118. Therefore, tags 104 cannot be inserted into slots 118 to align tag openings 105 with lock openings 124. The user must move the locking bar 110 to the locked position (shown in FIG. 4) with recesses 122 aligned with slots 118 in order to install tags 104 and attach a padlock 109 (shown in FIG. 4).

In one embodiment, locking bar 110 is spring-biased towards the locked position. Therefore, when second hasp jaw 116 is moved to the closed position, the spring force moves locking bar 110 to the closed position with recesses

122 aligned with tag slots **118** in back plate **106**. In other embodiments, locking bar **110** is spring-biased towards the unlocked position.

Referring now to FIGS. 6-9, components of lockout system **100** are shown in a perspective, exploded diagram. One embodiment of back plate **106** is shown in of FIG. 6 with a vertical orientation as is typical during use. As noted above, back plate **106** defines a plurality of tag slots **118** extending in a horizontal direction across front face **106a** of back plate **106**. In one embodiment, tag slots **118** extend from a back plate edge **106b** towards a back plate centerline **106c**. Tag slots **118** may extend from one or both back plate edges **106b** towards back plate centerline **106c**. Tag slots **118** opposite each other of back plate centerline **106c** may align with each other or may be vertically offset. In any case, all tag slots **118** are positioned to align with recesses **122** of locking bar **110** when locking bar **110** is in the locked position.

To receive locking bar **110**, back plate **106** also defines a locking bar slot **119** extending transversely (e.g., perpendicularly) to tag slots **118**. In one embodiment, locking bar slot **119** extends along back plate centerline **106c** and is perpendicular to tag slots **118**. In one embodiment, locking bar slot **119** and tag slots **118** are co-planar on back plate, but this is not required. For example, locking bar slot **119** and tag slots **118** may be formed to different depths in front face **106a** to accommodate tags **104** and locking bar **110** between back plate **106** and front plate **108** of when tags **104** and locking bar **110** have different thicknesses.

First hasp jaw **114** is secured to or formed with upper end portion **106d** of back plate **106** with first hasp jaw **114** extending away from upper end portion **106d** to define a portion of a closed loop. A pivoting connection **168** is made when a mounting hole **124** through upper end portion **106d** of back plate **106** is used to rotatably secure second hasp jaw **116**, such as by a screw, rivet, or other fastener **116b** configured to allow second hasp jaw **116** to rotate about mounting hole **124**. Second hasp jaw **116** is mounted to back plate **106** to overlap or otherwise align with first hasp jaw **114** to complete and define a closed loop when second hasp jaw **116** is in in the closed position.

Lower end portion **106e** of back plate **106** defines a lower recessed area **128** that receives lower end **110c** of locking bar **110**. In one embodiment, lower recessed area includes one or more springs **126** or other biasing device **126** positioned between lower end portion **110c** of locking bar **110** and bottom end **106f** of back plate **106** to bias locking bar **110** towards the locked position. For example, lower recessed area **128** defines one or more spring recesses **129** that partially receive springs **126**.

FIG. 7 illustrates one embodiment of locking bar **110**. In this embodiment, locking bar **110** has upper end **110a** to engage base portion **116a** of second hasp jaw **116** and extends along locking bar body **110b** to a lower end **110c**. Notches or recesses **122** extend transversely (e.g., perpendicularly) into locking bar body **110b**. Each recess **122** is shaped and sized to receive an end portion of tag **104**. Recesses **122** correspond to and align with respective channels **118** in back plate **106** when locking bar **110** is in the closed position. In some embodiments, upper end **110a** of locking bar **110** and second jaw **116** are one piece, where first hasp jaw **114**, receives part of second hasp jaw **116** or otherwise interfaces with second hasp jaw **116** when hasp **112** is in the closed position. For example, second hasp jaw **116** is formed with or fixedly attached to locking bar **110**, where sliding movement from the unlocked position to the locked position closes hasp **112**.

In some embodiments, lower end portion **110b** of locking bar **110** defines a frame **131** around tumbler opening **130** and includes a tumbler locking edge **132**. In one embodiment, tumbler locking edge **132** of frame **131** faces towards upper end **110a** and is sized to fit into and engage slots **170** in tumblers **154** (discussed below) when locking bar **110** is moved to the locked position. Thus, when locking bar **110** is in the unlocked position, the user may manipulate tumblers **154** to a desired position. When locking bar **110** is moved to the locked position, tumbler locking edge **132** engages tumbler slots **170** to lock the tumblers **154** in the position set by the user. Optionally, lower end **110c** of locking bar **110** defines one or more locking bar spring recesses **134** to receive spring(s) **126**, which may also be received partially by spring recesses **129** in back plate **106**.

In other embodiments, frame **131** is a separate component from locking bar **110**, where locking bar **110** engages frame **131** and pushes it towards bottom end **106f** when locking bar **110** is moved to the unlocked position. When tumbler locking edge **132** does not engage slots **170**, tumblers **154** are permitted to rotate and therefore can be set as desired by a user.

FIG. 8 illustrates one embodiment of a set of four tags **104**. Each tag **104** extends longitudinally from a first tag end **104a** to a second tag end **104b** and defines a tag opening **105**. In one embodiment, tag **104** generally is a flat bar with a rectangular cross-sectional shape. Other geometries are acceptable, such as cylindrical, domed, or other shapes. In one embodiment, first tag end **104a** is rectangular to mate with a rectangular notch or recess **122** in locking bar. In one embodiment, second tag end **104b** is rounded for comfort and ease of use. Other shapes for first tag end **104a** and second tag end **104b** are acceptable. Each tag identifier **104e** is useful, for example, to identify the name, department, and phone number of the worker locking out the equipment.

In some embodiments, tag **104** defines a ledge, groove, shelf or other feature (not shown) along one or both of sides **104c**, **104d** to engage a corresponding mating feature of slot **118**. For example, when slot **118** includes overhangs, tag **104** has a shelf or protrusion along sides **104c**, **104d** that fits below and slides within the space between the overhang and back plate **106** to maintain tag **104** in slot **118**. Similarly, tag **104** and slot **118** may engage each other using a tongue and groove or other mating structure on the respective parts.

FIG. 9 illustrates one embodiment of front plate **108**. Front plate **108** is sized and shaped to generally overlap and align with all or most of back plate **106**, however, this is not required. When slot **118** and tag **104** lack mating structures, front plate **108** is constructed to cover and close all or part of slots **118** and locking bar slot **119** to maintain tags **104** and locking bar **110** together with back plate **106**. For example, when front plate **108** is a solid metal plate except for fastener openings **135**, it extends fully across back plate **106** and aligns with edges **106b**. When front plate **108** covers lock openings **124** in back plate **106**, front plate **108** defines front plate lock openings **139** that correspond to lock openings **124**.

In one embodiment, front plate **108** defines and frames an open region **140** that allows the user to see the position of locking bar **110** and names or other identification on tags **104**. Optionally, open region **140** includes a transparent pane **142** of plastic, glass, or other material that restricts access to locking bar **110** and tags **104** yet allows their position or identification to be visible to the user. In embodiments where system **100** includes tumblers **154**, front plate **108** defines a tumbler opening **144** sized and located to enable the user to

manipulate and view the tumblers 154. Front plate 108 may be secured to back plate 106 using fasteners, welding, clips, or other means.

Turning now to FIG. 10, a perspective view illustrates one embodiment of optional tumbler assembly 150 in assembled form. Tumbler assembly 150 includes axle 152, a plurality of tumblers 154 mounted on and rotatable about axle 152, a resistance pad 156 for engaging tumblers 154, and a cover 158. These components are discussed below in more detail with reference to FIG. 11.

FIG. 11 is an exploded, perspective view showing components of tumbler assembly 150 and lower end portion 106e of back plate 106. In embodiments including tumbler assembly 150, lower recessed area 128 of back plate 106 defines a first axle recess 160 and a second axle recess 162 on opposite lateral edges of a back-plate tumbler opening 164. In one embodiment, tumbler opening 164 is positioned roughly at the center of lower recessed area 128 and permits tumblers 154 to extend through back plate 106 for manipulation by the user. Other positions are acceptable depending on the geometry of frame 131, locking bar 110, and other components.

Axle 152 has a cylindrical axle body 152c with optional flats 152a, 152b, machined into each axle end portion 152d, 152e, respectively. Axle end portions 152d, 152e are received in first and second axle recesses 160, 162, respectively, with flats 152a, 152b flush with or slightly below the surface of lower recessed area 128. Flats 152a, 152b prevent axle 152 from rotating with tumblers 154. Alternately, axle recesses 160, 162 can be machined to a depth that eliminates the need for flats 152a, 152b.

Vertically above and immediately adjacent back plate tumbler opening 164 is a resistance pad recess 166. Resistance pad recess 166 is sized and shaped to receive resistance pad 156 with front face 156a substantially flush with lower recessed area 128 and with a narrowed edge 156c of resistance pad 156 extending beyond resistance pad recess 166 to extend into and engage slots 170 of tumblers 154 as shown in FIG. 10. In one embodiment, resistance pad 156 is a substantially rectangular sheet of rubber or other resilient material. Resistance pad 156 has tapered/narrowed edge 156c extending toward tumblers 154 and defining a sloped surface 156c. Sloped surface 156c is angled at about 45° to front face 156a and faces downward and rearward. Thus, when narrowed edge 156c engages slots 170 of tumblers 154, tumblers 154 more freely rotate in a direction 172 cooperating with sloped surface 156d as compared to impeded rotation when rotating opposite of direction 172.

In another embodiment, resistance pad 156 is replaced with a spring-biased bar with rounded ball pins. The ball pins are biased to engage the tumblers and encourage the tumblers to occupy positions where slots 170 align with the ball pins.

Tumblers 154 are generally cylindrical and have a central opening 154a sized to receive axle 152 therethrough. Each tumbler 154 has a plurality of tumbler faces 154b evenly spaced circumferentially around tumbler 154 and separated by slots 170. In one embodiment, slots 170 are angled consistently with sloped surface 156d to accentuate ease of rotation in direction 172 and resistance to rotation opposite of direction 172.

Tumbler cover 158 attaches to front plate 108 when assembled as shown, for example, in FIG. 5. Tumbler cover 158 defines a view opening 174 that aligns with a row of tumbler faces 154b. Thus, when the user manipulates tum-

blers 154 to identify a date, a name, or other information on tumbler faces 154b, that information is visible through view opening 174.

Electronic Display

Referring now to FIGS. 12-14, other embodiments of lockout system 100 according to the present invention includes an electronic display 180 instead of tumbler assembly 150. Preferably, the electronic display 180 includes a processor 190 with data storage capability. In one embodiment, electronic display 180 shows the date when hasp assembly 100 was placed into the locked position or other information relevant to the locked-out energy source. Electronic display 180 in some embodiments receives an identifier associated with each tag 104 installed into hasp assembly 100. Electronic display also records the date when each tag 104 was installed and/or removed. In some embodiments, electronic display 180 allows the user(s) to input a date, identifier, name, work code, or other information. In some embodiments, a user may use a user-input device 185, such as a keypad or touch screen to access and view data stored in electronic display 180 and to determine who locked out the equipment and date of doing so.

In one embodiment, for example, the electronic display 180 is converted from an unlocked display condition to a locked display condition when the locking bar 110 is moved from the unlocked position to the locked position, respectively. In doing so, the locking bar 110 engages or disengages a switch, electrical contact, button, or the like on the electronic display 180 to cause the electronic display 180 to change condition. When the locking bar 110 is in the unlocked position, for example, a protrusion 182 on locking bar 110 disengages from a contact 184 or the like on electronic display 180, thereby changing electronic display 180 to the unlocked display condition. When unlocked, a user may input a date or other information relevant to the use of the lockout system 100. When locking bar 110 is moved to the locked position, protrusion 182 engages contact 184 and electronic display 180 is changed to the locked display condition and a user may not input new data or change entered data.

When one or more tags 104 are installed in hasp assembly 100, the processor 190 of electronic display 180 receives and records the identifier associated with each tag 104 and the date each tag 104 was installed. Other information may optionally be stored, such as the slot number on the hasp assembly 100, a code identifying work to be performed, a tag removal date, an identifier for the work to be performed, and other similar information. Optionally, when locking bar 110 is moved to the unlocked position, the data received from each tag 104 installed in the hasp assembly 100 are stored in a history file that includes information such as the identifier associated with each tag 104 installed in the hasp assembly 100, the date each tag 104 is installed in hasp assembly 100, and the date removed from hasp assembly 100. In some embodiments, electronic display 180 is programmable to collect and store information as desired or suitable. As such, electronic display 180 may include a keypad 185 or other data entry mechanism.

Referring now to FIG. 13, another embodiment of lockout system 100 is illustrated with hasp assembly 100 and a plurality of tags 104. In this embodiment, each tag 104 is configured and constructed to communicate with processor 190 in hasp assembly 100. As shown, processor 190 is part of electronic display 180; however, processor 190 is not necessarily part of electronic display 180. When hasp assembly 100 includes electronic display 180, processor 190 may be part of or coupled to electronic display 180.

In one embodiment, for example, contacts **186** on the tag **104** engage contacts **188** in a tag slot **118** on the hasp assembly **100** when tag **104** is installed in hasp assembly **100**. Each tag **104** may be coded with a worker identifier, contact information, and other relevant information. When each tag **104** is installed in a tag slot **118**, a circuit is completed and the processor **190** receives the data associated with each tag **104**. For example, processor **190** receives and displays the worker's identity and a date the tag **104** was installed in the hasp assembly **100**. Optionally, the processor **190** includes a transceiver **200** for communicating wirelessly with a computer **240** and database **245** (shown in FIG. **14**). With such a system, for example, each hasp assembly **100** communicates to the computer **240** the data received by processor **190** from each tag **104** as well as information determined by or stored in processor **190**, such as a date or hasp identifier.

Bluetooth Connective Systems

Referring now to FIG. **14**, yet another embodiment of lockout system **100** is illustrated with hasp assembly **100**, a plurality of tags **104**, a wireless network router **250**, and a plurality of computers **240**. Hasp assembly **100** communicates with tags **104** wirelessly or by a circuit formed when tags **104** are installed in the hasp assembly **100**. Hasp assembly **100** communicates with data base **245** and computers **240** using wireless router **250**.

In one embodiment, each tag **104** is equipped with a transmitter **204** and hasp assembly **100** is equipped with a transceiver **200**, where the transmitter **204** is configured to respond to a radio frequency signal transmitted by transceiver **200**, such as a data request. In some embodiments, transmitters **204** are passive: each transmitter **204** powers up and sends a reply signal after receiving a query from the transceiver **200**. The reply signal from tag **104** contains a tag identifier or other data that is received by the transceiver **200**. In other embodiments, transmitters **204** are active and periodically transmit a signal containing the tag identifier. Regardless of whether tag **104** communicates with hasp assembly **100** using wireless or wired means, when a tag **104** is installed in the hasp assembly **100**, transmitter **204** of the tag **104** communicates with transceiver **200** in the hasp assembly **100**. In doing so, the hasp assembly **100** recognizes the presence of one or more tags **104** installed in tag slots **118** of the hasp assembly **100**. Hasp assembly **100** may record and display the information on the hasp assembly **100** only, or may communicate the information to database **245**.

In some embodiments, transceiver **200** is configured to communicate wirelessly with database **245** and/or one or more computers **240**, such as via a wireless network of the Internet. Each computer **240** may be a general-purpose desktop computer, a tablet computer, a smart phone, a data logger, or other electronic device configured to display status indicators of lockout system **100**. In one embodiment, transceiver **200** communicates with computers **240** using a local area network with a wireless internet router **250**.

In some embodiments, transmitter **204** and transceiver **200** are configured to communicate using an electromagnetic field with a frequency of 120 KHz to 140 KHz. Frequencies of 125 KHz, for example, have been found to be better suited due to reduced interference from metal objects. In other embodiments, the electromagnetic field has a frequency of 13.56 MHz, 900 MHz, 2.4 GHz, 5 GHz, or other frequency suitable for the range, antenna size, and environment where lockout system **100** will be used. In some embodiments, communication between tag **104** and transceiver **200** uses a first frequency of 120 KHz to 140 KHz while communication between transceiver **200** and com-

puter **240** uses a second frequency that is different from the first frequency, such as 2.4 GHz.

In one embodiment, each computer **240** and each hasp assembly **100** wirelessly communicate with database **245**. The database **245** may be maintained in one or more computer **240** or at some other location accessible by each computer **240** in system **100**, such as "the cloud" or a remote location. In one embodiment, database **245** acts as the master data storage location for all hasp assemblies **102** in lockout system **100**. Database **245** is preferably updated in real time when a change occurs at any of the hasp assemblies **102** and stores information for each hasp assembly **100**. Periodic updates are also acceptable, either by a data push from hasp assemblies **102** or a data pull from database **245**. A condition change at any hasp assembly **100** includes a change in tags **104** installed in hasp assembly **100**, a change between locked and unlocked status of the hasp assembly **100**, change of a date for end-of-work, and the like. Using the database **245** that is distinct from hasp assemblies **102** reduces the computing requirements and power requirements for each hasp assembly **100**.

By viewing the data on a computer **240**, such as tablet computers **240a** carried by management and supervisors or desktop computers **240b** in an office, the management is informed of the current lockout status of each energy source without having to visit each worksites throughout the facility. As noted above, for example, each computer **240**, database **245**, and each hasp assembly **100** communicate using a wireless internet router **250**. Data **104f** communicated from the hasp assembly **100** may include a unique tag ID, an energy source identifier, a worker identifier, a lockout date, a tag installation date, a tag removal date, and/or a lockout status identifier. For example, for each energy source identified as locked-out, computer(s) **240** display the identity of the worker(s) who have locked out the energy source, the dates each tag **104** was installed in the hasp assembly **100**, and other information **104f** as deemed appropriate. Further, by communication between each hasp assembly **100**, database **245**, and computer(s) **240**, management and workers may be able to determine the location of each hasp assembly **100**, whether in use or not, thereby preventing loss of hasp assemblies.

Lockout system **100** with embodiments of hasp assemblies **102** and tags **104** discussed herein is used to lockout one or more piece of equipment or energy source. After placing hasp **112** in the open position, hasp **112** is attached through an opening on a switch, valve, control panel, or other control tied to the energy source. After closing the hasp **112** and moving the locking bar **110** to the locked position, each user performing work on the energy source may independently install his/her tag **104** into an open slot **118** of hasp assembly **100**. The user then locks the tag **104** into the hasp assembly **100** with a padlock **109** or other secure device placed through tag opening **105** and lock opening **124**.

Depending on the embodiments of hasp assemblies **102** and tags **104**, lockout system **100** may be used to facilitate compliance with lockout/tagout protocol and manage locked energy sources at a facility.

Alternative Lock Out Devices

Further embodiments of the present invention will now be discussed with reference to FIGS. **15-24**. As the majority of the structural and functional features of these embodiments are similar to those previously discussed, only the distinctions will be emphasized in detail here. As before, channels **118**, **122** in the first and second body portions **102**, **103** of the lockout system **100**, accept ID "IDENTIFICATION" tabs **104** that prevent the hasp jaws **114**, **116** from opening. In

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some embodiments though, the number of slots **118** are doubled from previous embodiments by providing slots **118** along the front and rear of the main body portions **102**, **103**.

Referring to at least FIGS. **15-18**, **21**, and **22**, the first body portion **102** is integral with the right-side portions of the back plate **106**, locking bar **110**, and front plate **108**, and the first hasp jaw **116**. With these embodiments, the second body portion **103** is also similarly integral with the left-side portions of the back plate **106**, locking bar **110**, and front plate **108**, and the second hasp jaw **114**.

As before, slots **118** along the back-plate portion **106** correspond with recesses **122** of the locking bar portion **110** which correspond to a shape of the tag **104**. Each channel slot **118** on the hasp body **102**, **103** meets an additional corresponding hole **124** that is in a fixed position to align with the hole **105** on the ID tab **104**. The slots **118** extend horizontally, while each of the corresponding holes **124** extend laterally. Two tabs **104** can then be inserted in horizontally adjacent slots **118** by slightly offsetting their inward facing positions laterally such that each of the two adjacent tabs **104** has a single channel **105** interlocking with adjacent dual front and rear channels **124**. The axis of the rotating point **168** extends laterally and parallel to the padlock holes **124**, **105** to prevent rotation of the body **102**, **103** while the padlock is locked.

Increased Tag Support Per Device

One of the shared features for several of the models in FIGS. **15-24** is an overall increase in the number of tags per device area. With earlier models as, for example, in FIGS. **3-9**, the overall lockout device **100** is capable of fitting at most eight tags **104**, and the embodiments shown in FIGS. **3-9** have a basic overall size of 10-14 inches long, and 4-5 inches wide for a device area of between 40-70 square inches (in²). This provides an average tag capacity of one tag per 5-9 square inches (in²) of device area.

The models in FIGS. **15-24** show a slight rearrangement of parts as illustrated in order to provide an overall increase in the number of tags per device area to at least an average tag capacity of one tag per 2-5 square inches (in²) of device area. That is, in the embodiments having this increased tag capacity, the overall sizes are between 6-14 inches long, and 2-5 inches wide, for an overall range of device area of 12-70 square inches (in²); while each has a capacity between 6-12 tags **104**. For example, the embodiment in FIG. **15b** is slightly wider of approximately 5 inches, but by providing an alternating attachment and securing profile by providing the rotating point **168** at a half way point and eliminating the electronic display, the overall length has been greatly reduced, so that even when including the lengths of the hasp jaws **114**, **116**, the length of the lock out device **100** still enables a reduced overall device area of approximately 40 square inches. Then, as this embodiment has the capacity for at least twelve tags **104**, the average tag capacity of approximately one tag per 3 square inches.

Restated in ratio form then, the embodiments in FIGS. **15-24** have at least an average tag capacity to device area ratio of 1:5, where the device area is in square inches.

The tags **104** often have tag identifiers in the form of the electronic display **180** (see, e.g., FIGS. **17**, **18**), capable of displaying information either by permanent written format or by alterable electronic format, such as the authorized user's Name, Title, Department, and phone number. In some embodiments, the hasp assembly **100** will accept ten ID tags **104** by providing increased capacity in the front and back: five tags **104** along the first body half **103** front side, and five tags **104** along the second body half **102** front side.

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Alternative Pivoting Connections

As with other embodiments, the pivoting connection **168** rotatably secures a first hasp jaw **114** to a second hasp jaw **116**. In these embodiments though, a first hasp jaw **114** is integral with the first hasp body half **103** and the second hasp jaw **116** is integral with the second hasp body half **102**, so that the first hasp body half **103** rotates with respect to the second hasp body half **102**.

The alternative pivoting connections in these embodiments address potential issues with earlier embodiments. Specifically, one weakness of other models is the tensile strength of the hasp jaw and the singular point of connection with the hasp jaw to the main body of the of lockout system. By integrating the main body portions with first and second hasp portions, the overall strength of the lockout system is improved. Further an advantageous feature of these embodiments, by integrating a first hasp jaw with a first hasp body portion which comprises slots for tags; and a second hasp jaw with a second hasp portion which comprises slots for tags, a single defective pivoting connection will not prove sufficient to enable access to the energy source being protected against interference.

For example, in FIG. **15**, each tag interacts not only with the slot provided in the main body portion, but due to the integration of that body portion with the hasp jaw, provides an additional security measure against inappropriate tampering against opening the first and second hasp jaws.

The placement of the pivoting connection **168** in these embodiments may vary. In FIG. **15A** the pivoting connection **168** is positioned along the hasp jaw. In FIG. **15b** the pivoting connection **168** is positioned half-way between main body portions both lengthwise and widthwise. In FIG. **15c**, the pivoting connection **168** is positioned at a bottom right hand corner, and in FIGS. **15**, **16-24**, the pivoting connection **168** is positioned opposite the hasp jaw. In the embodiment in FIGS. **17-24**, the pivoting connection **168** is formed when a tongue of the first hasp body half **103** snaps into a groove along the second hasp body half **102**, permanently locking the two hasp body halves **103**, **102** together. The tongue slidingly engages the groove of the radius of the connecting parts of the hasp so that it can open and close. A slight offset is illustrated in FIG. **21**, showing the hasp body **102** and a single tag **104**.

In some embodiments, the PCB assembly is housed entirely inside the connecting radii of the two halves. The first hasp body half **103** is dimensioned with a first cavity to internally house a PCB assembly **181** having electronics, such as the electronic display **180**, processor **190**, transceiver **200**, transmitter **204**, and circuit board. Four posts along the back side have notches which go through the four associated mounting holes **135** at each corner of the circuit board **210** and snap the PCB assembly **181** in place. Alternatively, these posts could be hollow and accept mating screws for securing the PCB assembly **181** in reversible manner.

The first body half **103** is also dimensioned with a window to view the electronic display **180** on the exterior front half **106a** of the hasp **103**. A second cavity is centered underneath the display **180** and dimensioned to accept the control button **185** of the PCB assembly **181** that controls the output of the display **180**.

Directional Terms

General directional terms employed throughout the description of the figures include the terms: horizontal, vertical, and lateral. Horizontal generally having the meaning of being in a position or direction at right angles to the vertical and lateral directions; generally parallel to ground

level; also associated with movement or direction along the x-axis. Vertical generally having the meaning of being in a position or direction perpendicular to the plane of the horizon; generally at right angles to the horizontal and lateral directions; also associated with movement or direction along the y-axis. Lateral generally having the meaning of being in a position or direction at right angles to the vertical and horizontal directions; generally parallel to ground level; also associated with movement or direction along the z-axis.

Although the preferred embodiments of the present invention have been described herein, the above description is merely illustrative. Further modification of the invention herein disclosed will occur to those skilled in the respective arts and all such modifications are deemed to be within the scope of the invention as defined by the appended claims.

REFERENCE NUMBERS

Provided below is a listing of the elements of the present invention and their associated reference numbers which have been adhered to within the present specification and the associated drawings.

lockout system	100
hasp assembly body	102, 103
plurality of tags	104
tag ends, sides	104a-d
tag identifier	104e
identifying information	104f
tag opening	105
back plate	106
front face	106a
edges	106b
centerline	106c
end portions	106d, 106e
bottom end	106f
back side	106g
front plate	108
padlock	109
locking bar	110
end portion(s)	110a, 110b, 110c
hasp	112
hasp jaw(s)	114, 116
base portion	116a
fastener	116b
second channel portion/slots	118
locking bar slot	119
adjustable tumbler assembly	120
first channel portion/recess	122
lock openings	124
springs/biasing device	126
lower recessed area	128
spring recesses	129
tumbler opening	130
frame	131
tumbler locking edge	132
bar spring recesses	134
fastener openings	135
plate lock openings	139
open region	140
transparent pane	142
tumbler opening	144
tumbler assembly	150
axle	152
tumblers	154
resistance pad	156
cover	158
first axle recess	160
second axle recess	162
back-plate tumbler opening	164
resistance pad recess	166
pivoting connection	168
slots	170
posts	171

-continued

first direction	172
view opening	174
electronic display	180
protusion	182
contact(s)	184, 186, 188
user-input device	185
battery cover	189
processor	190
transceiver	200
transmitter	204
computer	240
database	245
wireless network router	250

We claim:

1. A lockout system comprising:

at least six tags, each comprising an elongated plate with a first end and a second end, wherein each of the at least six tags defining a laterally extending tag opening; and a hasp assembly comprising: a first hasp portion having a first loop portion and a first body portion, and a second hasp portion having a second loop portion and a second body portion, the first and second body portions defining a plurality of slots, wherein each of the plurality of slots is sized and shaped to receive one of the plurality of tags, the first and second body portions further defining a plurality of lock openings, and wherein each of the plurality of lock openings is sized, shaped, and positioned to align with the tag opening of a respective one of the plurality of tags received within a respective one of the plurality of slots;

wherein the second hasp portion and the first hasp portion are movable relative to one another, such that the first hasp portion and the second hasp portion have at least: (a) a first position, in which the hasp assembly is in an unlocked position, and (b) a second position, in which the hasp assembly is in a locked position;

wherein when at least one tag of the plurality of tags is received in the hasp assembly, the hasp assembly is prevented from moving to the unlocked position.

2. The lockout system of claim 1, further comprising: a pivoting connection formed between the first hasp portion and the second hasp portion.

3. The lockout system of claim 1 further comprising a first cavity formed in the first hasp portion; and a second cavity formed in the second hasp portion; and

an electronics assembly mounted in the space formed by the first and the second cavities formed in the first and second hasp portions.

4. The lockout system of claim 3 further comprising: an electronic display visible through a window formed in one of the first and second hasp portions;

electrical slot contacts in each of the plurality of slots and coupled to the electronic display; and

electrical tag contacts on each of the plurality of tags; wherein any one or more of the plurality of tags installed in the hasp assembly results in a completed circuit with the electronic display.

5. The lockout system of claim 4 further comprising: a transmitter circuit on each of the plurality of tags; and a transceiver circuit coupled to the electronic display; wherein each of the plurality of tags communicates wirelessly with the electronic display when installed in the hasp assembly.

6. The lockout system of claim 3 further comprising: a database disposed in communication with the hasp assembly;

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one or more computers disposed in communication with the database; wherein the hasp assembly communicates lockout information to the database and each of the one or more computers is configured to display the lockout information to a user.

7. The lockout system of claim 6, wherein the lockout information includes one or more data selected from the group consisting of a lockout status, a tag identifier, a lockout date, and a slot identifier.

8. The lockout system of claim 1 further comprising a pivoting connection rotatably coupling the first hasp portion and the second hasp portion, thereby enabling the first hasp portion and the second hasp portion to be movable relative to one another.

9. The lockout system of claim 1, wherein at least two of the at least six tag openings are vertically parallel, horizontally overlapping, and laterally displaced from one another.

10. A lockout assembly for a lockout system having a plurality of tags, each of the plurality of tags comprising an elongated plate with a first end and a second end, wherein each of the plurality of tags defining a laterally extending tag opening; and the lockout assembly comprising:

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a first hasp portion having a first loop portion; a second hasp portion having a second loop portion; a plurality of slots in the first and second hasp portions, wherein each of the plurality of slots is sized and shaped to receive one of the plurality of tags; a plurality of lock openings in the first and second hasp portions, wherein each of the plurality of lock openings is sized, shaped, and positioned to align with a laterally extending tag opening of a respective one of the plurality of tags received within a respective one of the plurality of slots; and a pivoting connection rotatably coupling the first hasp portion and the second hasp portion, wherein the first hasp portion and the second hasp portion are movable relative to one another between an unlocked position and a locked position in which the first loop portion and the second loop portion define a closed loop; wherein when at least one tag of the plurality of tags is received in the lockout assembly, the lockout assembly is prevented from moving from the locked position to the unlocked position.

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